J. Nelson Spaeth

Vol. XXIII December, 1925 No. 12

JOURNAL of FORESTRY

Published by the

Society of American Foresters

Single Copies 65c **Yearly $4.00**

Entered as second-class matter at the post-office at St. Paul, Minn., under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized November 20, 1918

ANNUAL MEETING, DECEMBER 16-17
Madison, Wisconsin

JOURNAL OF FORESTRY

A professional journal devoted to all branches of forestry

EDITED BY THE EDITORIAL BOARD OF
THE SOCIETY OF AMERICAN FORESTERS

Officers and Members of Executive Council of the Society of American Foresters for 1925

The JOURNAL appears monthly.

The pages of the JOURNAL are open to members and non-members of the Society.

Manuscripts intended for publication should be sent to Raphael Zon, Lake States Forest Experiment Station, University Farm, St. Paul, Minn., or to any member of the Editorial Board.

Missing numbers will be replaced without charge, provided claim is made within thirty days after date of the following issue.

Subscriptions, advertising and other business matters may be addressed either to the JOURNAL OF FORESTRY, University Farm, Saint Paul, Minnesota, or to Atlantic Building, 930 F Street N. W., Washington, D. C.

JOURNAL OF FORESTRY

VOL. XXIII DECEMBER, 1925 No. 12

A QUARTER CENTURY

This issue of the Journal marks the completion of a quarter century in the existence of the Society of American Foresters. In the life of a society twenty-five years is barely comparable to the childhood of man. In the lives of the individual members who have grown up with the Society, twenty-five years covers the best and most active years of their work. While the Society, therefore, is young, the older generation of foresters have grown a bit grey and meditatively begin to look back over their struggles, aspirations, and mistakes, and count up the results accomplished. Measured by any standard, the past twenty-five years was a glorious period. The spirit was young, the difficulties great, and the faith strong.

The goal is still far away, yet with the greater recognition of forestry in this country, with the larger influence which forestry begins to wield, with the increased age of its members, growing appreciation of physical comforts, and increased prosperity—yes, prosperity—will the spirit remain undaunted, the energies indomitable, and the ideals high and bold? And should the old timers become, with age, smug, practical, and conventional, let the younger generation take away from them the old banner and carry it forward. Forestry in this country must and will irresistibly go ahead!

FORESTRY IN FINLAND

By Dr. C. A. Schenck

Forester at Large

Finnish forestry is Cajander's forestry.

Cajander is that rare combination of scientist and of lumberman which makes for success in forestry.

Cajander is more: As chief of forestry, mainstay of Finland, Cajander has been called, on two occasions, to preside as Finland's political president over the fate of his new state and nation.

On a recent visit to Finland, Cajander presented me with a riddle: "What," he said, "is the difference between forestry in the South, in the Middle and in the North of Europe?"

I could not solve the puzzle.

The solution, after Cajander, is this:

In the South, the formation of a second growth is almost impossible; in the Middle, the second growth is man's work; in the North, Nature does the thing unaidedly, spontaneously.

And so it is: While Sicily and Spain are barren, there exists in Finland, northernmost state of all Europe, on millions of acres a second growth better, healthier and more promising than what is found anywhere else on earth. Cajander did not make it; its existence is Cajander's good luck; Nature made it.

Does Cajander's puzzle apply, with equal force, to the South, to the Middle and to the North of the U. S. A.?

I am not sure; possibly, it applies more to the American West than it does to the American East. In the East, it seems to me, as if the South, and not the North, were Nature's favorite for a second growth.

Of course, Cajander knows better than I do that latitude alone does not determine upon the chances of a second growth.

The factors governing the problem are three, in the main, and they are not connected with latitude, *per se*.

There is, firstly, the density of the population, and notably the density of the farming population which counteracts the rejuvenescence of the woods from China to France and from Sicily to Finland.

Secondly, the chances for a second growth depend on the prevalence of fire-resisting and of fire-aided tree species such as the two- and three-needled pines.

And thirdly, there is the water factor: Water precipitated as well as water stored (as snow, as soil moisture, as atmospheric moisture, as lakes, etc.). How much and when is water precipitated and is water stored?

With these three factors, latitude has certainly less to do than have history and topography and geology in general.

On neither of the trio do we have any influence. Some countries are particularly favored—like Finland, like the American Southeast—while others can not have a second growth unless it be established by foresters.

It will be hard for the ill-fated countries to compete, silviculturally and economically with the favored ones.

In Finland, there is but one means to prevent the woods from reconquering in a whiffy what ground they lose through devastation: the plough. Stop ploughing, and the second growth establishes itself unfailingly, unflinchingly, doggedly.

The rule applies to Finnish private lands as well as to Finnish National Forests. The private type prevails by far in the Southern half of Finland inhabited by 95 per cent of the population. The National Forests, some 30,000,000 acres, are found in the thinly-peopled Northland.

The Finnish timber species are Scots pine, Norway spruce and birch; none else.

No country depends today so much on her forests as does Finland. Eighty per cent of her exports are forest-born. Farming is next in importance to forestry; but farming without farm woodlots and without forest-labor is, in 90 cases out of 100, impossible; the majority of the farm hands are working, during the major part of the year, wholly or partially in the woods.

The chief industries of Finland are forest industries such as sawmills, planing mills, pulp mills, paper works, barrel works, furniture works and match factories.

There is plenty of waterpower, much of which is undeveloped. But what is the use of power development unless there be available some raw material other than air to which it might be applied?

Alas, there is no coal in Finland, and there is no ore; there is nothing to be powerized but wood and timber, timber and wood. In the absence of coal, wood is the universal fuel in household, in factory, in locomotives.

A fuelwood market may be a curse to the forests: It is a boon for forestry.

In Finland, wood and timber are transported, to begin with, during winter on sleds over snow and ice sure to last, and thereafter during spring and summer, over millions of miles of water courses, rivers and rivulets, lakes and lakelets, until they reach their final destination in the markets or in the factories.

Thus it is that Finland, in size a little smaller than is Germany, is that country or that nation of our globe for which forestry is most important; every lumberman, if not every man in Finland is realizing the necessity of forestry; education in forestry is making rapid progress: Cajander is the man behind the guns.

Meandering through Finland on a course some 2,000 miles long, I have seen an unbroken second growth some 20 to 80 years old; but I have seen but five tracts—all of them comprised in National Forests—which an American lumberman would care to tackle. The scarcity of real timber-stands finds its explanation in the history of Finland. This history runs parallel to that of the U. S. A. and is, for that reason, particularly interesting.

Two hundred years ago when Finland was a dependency of Sweden, the primeval woods began to be invaded and to be extirpated. Trees were weeds; timber had no stumpage value; at best, trees were farm-fertilizers, by their wood ashes and by their humus. The pioneer, after firing, deadening, log rolling and clearing, was in the habit of using the field established for three or four years and to allow it, during a subsequent period of pasturage extending over 25 to 35 years, to revert to a second growth. The second growth, in turn, was in due time fired, deadened, cut and heaped and burned; and there followed another farming period producing rye and oats, during three or four years. This sort of a farming routine was and is kept up to the present day, "fire-farming." It still exists, here and there, near the Russian frontier.

One hundred years ago, when Finland became a dependency of Russia, the entire Southern half of Finland was, or had been, more or less fire-farmed. By that time, this Southern half had become fairly settled; yet there was no lumber industry, and there were no forest exports other than small amounts of wood ashes and of wood tar.

Stumpage began to have a value when (since 1850) steam sawmills sawing for export became established in some favored spots and when (since 1875) the pulp and the paper mill made its appearance.

In those pioneer days, many a Finnish lumberman with the vision of his American colleagues succeeded in buying for a song from the farmers what woodland was tributary to his mill-site.

From that time on, the time-honored mode of fire-farming began to be abandoned; what good trees there chanced to have been left, were converted into lumber; the seedlings developing on the old fire-farms are the trees, 60 to 80 years old, of today on which the modern lumber industry of North Finland depends for its existence.

From nothing in 1850 the forest exports have risen to huge proportions: Can they be maintained? Is there any danger of shrinkage of supplies? Are the forests exhausted or exhaustible?

Cruising the entire country on parallel lines 16 miles apart, Cajander's forest service has obtained the conviction that the annual cut in all woods, heavy that it is, does not exceed the annual growth in all woods. True, the private forests in the South are somewhat over-cut; but the National Forests in the North are decidedly under-cut; and the balance of the woods' ledger is thus maintained.

There is one great danger: It consists in the excessive cutting of small sticks (mine props for England, fuelwood for the cities, charcoal for the industries, pulpwood for the paper works, native and foreign), removed to the detriment of value-production, of labor applicable to heavier sticks, and of natural seed regeneration.

So as to prevent utter recklessness on private lands, a recent law puts the ban on cuttings made without a thought of regeneration; immature stands may be thinned but must not be clear-cut; when mature stands are removed, some few seed trees must be left; all operations are subject to permits issued by the forest commissions of the towns which in turn are supervised by county forest commissions. From what I have seen on my journeyings through the woods, the law is fairly well observed.

From the silvic standpoint, the second growth of South Finland, chance product that it is, presents a perplexing variety of forms. True, established on fire-farms, even-aged stands prevail; others have the earmarks of the shelterwood types, in strips, in groups; again others are fine examples of two-storied high forests either of pure pine or else of pine over spruce: again others resemble coppice over standards, the coppice consisting of brush-alder, the standards of birch and spruce and pine. Indeed, the selection type is not missing where a small owner (and his forebears) have been milking the woods, tree by tree. But whatever the appearance of the second growth may be, it is won-

derfully healthy, free from disease, straight and sound and vigorous. And a third growth is coming up as if by magic.

Are there no forest fires in a country where, quite recently, fire-farming was in vogue?

Certainly, there are forest fires; but they are, to all appearances, surprisingly rare, rare in spite of the fact that most private woodlands are used for stock pasture. Traveling the length and the breadth of the land I have not seen any blackened wastes of stump land, whatsoever.

There is a reason, several reasons.

The primeval débris were all consumed, decades of years ago, at the time of fire-farming.

Logging by steam is impossible. The trees are too small and the natural means of log transportation are too good and too omnipresent. During 200 days of the calendar year, the Finnish soil is covered with snow; during the melting days of the year, it is kept moist; high and dry winds are rare.

Anyhow, holocausts in Finland are impossible. The pines are fire-resistant. The multitude of water courses in "Suomi," the country of ten thousand lakes, prevents the fires from spreading. The regeneration of pine and birch—and also of the grey-alder, a short-lived nurse crop comparable to the Oregon alder—is actually favored by forest fires.

When there are "unprecedented" seasons of drought, the Finnish militia whose summer camps are scattered all over the country, are summoned for aid. They have some airplanes, too. Armies are good instruments in the war against forest fires where army discipline is wanted; they are good instruments in particular when the soldiers, as is the case in Finland, are drafted from the woods. Fully admitting that disarmament is a good thing for the safety of the world we can not help but concede that it would be a bad thing for the safety of the woods—in Finland!

There is no forest planting in Finland unless it be done experimentally, under the auspices of the National Experiment Stations which have actual charge of a number of National Forests. And yet the best and the most enlightened forest planting that I have seen in Finland—and indeed anywhere on the two hemispheres of this globe—is done by a retired state senator, Dr. Tigerstedt by name, on his Mustila estate near Borga. Tigerstedt is a planting genius. He knows instinctively or intuitively what factors are needed for success. There

are no failures. At Mustila, by the way, the five-needled *Pinus peuce* is immune from blister rust in a magma of *Pinus strobus* succumbing to it.

What about forest working plans?

All the large forest stock companies have working plans made by their university-trained foresters (who have charge also of all logging operations).

The small owners are working their woods at haphazard. They are slow to join the co-operative societies of wood owners favored by Cajander which, so far, restrict their operations to the joint sale of timber, thus getting prices better than those obtained at individual sales.

The nation, of course, has working plans for all the forests in which any work is possible. Dr. O. J. Lakari, known by his capital essays on growth of pine and spruce, on form of pine, on pruning, on age classes in the primeval woods, on forest types of North Finland, is chief of working plans and is, incidentally, Cajander's right-hand man.

The national working plans, for the scattering National Forests of the South, where fuel wood and where small stuff has a market, do not differ from the common-sensical and conservative schemes found everywhere in Europe. When we turn to the huge National Forests of the North which have never been logged, never been fire-farmed, never been colonized (the climate is non-agricultural) and have never been opened up by roads and railroads, considerations come into play of an entirely different nature. None but the best sticks have a value. The market is far away. There is no local labor to work in the woods or to work in the mills. The rivers are full of impediments to driving. Trails even are lacking. No one knows where the stumpage is, how good it is, how much there is, how accessible it is. It is this lacking knowledge which the working plan provides for an untouched National Forest of the North. Step by step, under the provisions of the plan and at the expense of the nation, the watery means for permanent log transportation are being provided. Loggers' colonies are established. There is no thought of a chimerical fixed rotation. The cut and the work of the next ten years is outlined—and the subsequent proceedings interest us no more. Annually, the trees to be cut are hammer-marked on areas made accessible heretofore. The trees, arranged in size classes, are offered to the lumber world at huge auction sales. If the bids are unacceptable, the nation becomes logger and mill-man on its own account. Cajander and his foresters are real, fully-

fledged lumbermen. Also, the Finnish nation owns several sawmills, in direct charge of the forest service; and it further owns the majority stock in two of the largest Finnish lumber and paper companies.

Let me describe the newest and the finest of the sawmills operated by Cajander's National Forest Service. It is acknowledged to be the most up-to-date mill in the whole country.

Take a map of Europe and find the northernmost point of the Baltic Sea. On the Finnish side, you will discover the town of Kemi at the mouth of the river Kemi-joki. Here, by land exchange, the nation has obtained control of the island, Veitsiluto, at a distance of a mile from the mainland. The Kemi-joki drains some 15,000,000 acres of National Forests and it brings the logs, with the help of booming and driving companies, to the several private sawmills as well as to the national sawmill erected on the island Veitsiluto. The nation is a stockholder in the booming and driving companies—of course!

Veitsiluto covers some 500 acres. The space between mainland and island, well protected from the winds, is its log-yard. The southern third of the island contains the residential quarters, housing the families of some 500 employees. The northern third is covered by the lumber yard ending in the loading docks for lighters. In the midst of the island is the brick-built power house and the sawmill. All machinery, in mill and in yard, is driven by electricity.

The mill is a wonder; there are four log hoists to convey 3,000 logs in 16 hours to the six log gangsaws arranged in pairs on the mill deck. These are of the most modern type, made by Bolinder in Stockholm. Three edgers follow behind the saws. Queerly, there are no trimmers in the mill. The reason appears later on. Timber and lumber are conveyed to the sorting shed; the inspector, by pressing one of some 80 electric buttons, causes each piece passing before him to drop automatically on one of the 80 railroad cars on which each length, width and kind of lumber is collected. Electric locomotives convey the loaded cars to the lumber yard, viz., to the loading cranes within the lumber yard. The Finnish method of yard-stacking differs from anything I have seen in America and in Europe. All stacks are huge; all are fairly square; the lumber is piled loosely, without stickers; all odd ends are pointing toward the inside of the pile. Each avenue of stacks is fronted by an electric car line while there is running, in and along its rear, an electric conveyor sending the air-dry boards to the loading dock. It is here, only here, at the loading dock, at the tail end of the conveyor, that the boards are trimmed by 15 portable trim-

mers, to the varying lengths required by the English, by the Dutch and by the French markets. The entire output is exported. Each board is grade-stenciled, and the Finnish crown stamped on each end is the proud proof of superior manufacture and of superior grade. The stenciling, by the way, is done by boys 15 to 16 years old residing on the island and not strong enough to work at harder jobs. The loading lists are taken by young girls. The lumber is put on lighters. The lumber steamers, mostly tramps, conveying the goods to foreign ports, are anchored in deep water, some two miles away from the island.

And now comes a surprise: The director of the mill is a forest supervisor taken from the ranks of the National Forest Service. He has studied under Cajander when Cajander was professor of forestry at the Finnish Forest School connected with the university at Helsinki. The director's name is J. Sepälä, and a corking good director he is. Sepälä, as well as his assistant forester and his engineer, are drawing, aside from their regulation salary, a small percentage of the profits of the enterprise. Why not? The nation as a producer competes with private producers, not merely in the lumber markets; it competes with them also in the labor market where the best man fetches and ought to fetch the best price.

All lumber sales are made by the foresters of the National Forest Service at the capital, Helsinki; the Service employs a staff of agents in England and in other countries; thus it is kept awake to the fluctuations and constellations and demands of the markets of the world. The prices which the Service obtains for its goods are top prices. The success of the nation as a lumberman is complete.

The man behind it all is A. K. Cajander. How is it possible that Cajander, scientist that he was and that he is, can obtain such practical results?

The secret is this:

Cajander is and is recognized to be a splendid organizer.

Cajander knows men as well as he knows plants. Why should one knowledge exclude the other?

Cajander applies his scientific scrutiny and thoroughness to practical problems. Why should that be bad for practice which is good for science?

And Cajander is an inspiration to all his co-operators.

What lessons in forestry can we take from Finland to America?

1. IN POLITICS: America is a democracy; the fates of its many industries are molded by politics; so is the fate of forestry. If an American forester were to imitate Cajander and were to become president of the U. S. A. (or at least governor or senator of a leading state), the chances for real progress in forestry would be sublime. Have we in American forestry forgotten where we would be had it not been for our *political* Pinchot, in the Rooseveltian era? We foresters may dislike politicians and politics, but the fate of the woods depends on them, undoubtedly, in a democracy such as exists in Finland and in America.

2. IN LUMBERING: Like the Finnish foresters, American foresters should turn to lumbermen. Lumbering is a part and it is the chief part of forestry. Why should there not be, in America as in Finland, national sawmills and paper mills, with real foresters in charge, and paid according to their merits? The absence of government sawmills in Germany and in France (where technical and practical work was and is beneath the dignity of the officials) is no reason for their absence in the U. S. A.

3. IN MILITARISM: An army which is not available at any time for the protection of natural national resources should be at once demobilized and dismissed. If Finland can employ her army for the protection of the Finnish woods, why can not we do likewise in the American woods?

4. IN PATIENCE: It took 75 years, from 1850 to 1925, to put Finnish forestry on its legs. In the U. S. A., we have had but 25 years to do likewise. Everything comes to him who waits; waiting doggedly. Nothing comes to him who waits; waiting peevishly. Let us be doggedly patient!

SELECTIVE CUTTING—BY LAW!

By F. W. Luening

The Milwaukee Journal

Once, in an unguarded moment, I told an officer of the Northern Hemlock and Hardwood Association that Congress or the states ought to decree a public interest in trees.

I said that trees are not orthodox private property—can not be, because the public depends too much upon them. Agricultural prosperity, stream flow, water power and flood and drought conditions, not to mention the future lumber supply, are influenced too largely by trees to permit them to remain in strictly private control.

That Hemlock Association officer has not forgiven me yet. He has me tagged with a red label and branded with a capital "B." The B stands for bolshevist.

That's what comes of frank opinions, plainly expressed to officers of Hemlock associations.

In fact, I have too much fondness for private property to qualify even as a third-class bolshevist. Any rising young misanthrope who thinks he has a half-share in my player piano will have to fight for it. Any political party proposing to socialize my flivver is off my calling list. But this tree business is different.

Now W. D. Connor, Sr., one of the oldest, perhaps one of the biggest lumber operators in the Lake States, with interests centered around Marshfield and Laona in Wisconsin but extended, also, to the Pacific Coast, supports these "bolshevist" ideas.

I am going to quote Mr. Connor, but that does not mean that I recite his exact language. I do not. However, in substance this is what he tells the foresters of the nation, the lumbermen of the Lake States, the people of the country generally:

"Forests are a crop. They can be grown. They will regrow themselves—and profitably—if given a chance. I do not theorize about it—I know. It is our duty to GROW forests—or at least to allow them to regrow themselves. The first step is restricted cutting by the lumbermen. They must stop taking everything in the forests. They injure themselves and the public when they cut clean, harvesting little, worthless stuff and leave nothing on the land. They should cut selectively and they should do it of their own volition. But if they will

not do it voluntarily, they should *be made to do it by law.* The law should not be radical. Plain, sensible legislation, decreeing a public right in trees and insisting that a reasonable number be left on any land that is logged is needed.

"There is every reason for leaving the young trees. They have little market value, add little to the worth of the forest harvest, and they would replenish the forests if they were left to grow. So, if lumbermen will not leave them voluntarily, they should be made to do it by law.

"Of course, that is only a half-solution of the forest problem. There is no sense in leaving young trees on forest land if they are merely to be burned. Under present conditions they will be burned. Fire will inevitably destroy them, as it always does. So, before lumbermen can save young trees, government must assure fire protection. Individuals or corporations can not fight fires. We do not expect a manufacturer to protect his plant, in a city, a merchant his store or householder his home. Instead we create municipal fire departments to do it. Exactly so do we need state fire departments to protect the property of the lumbermen—a property in which the public has a great interest.

"The states must assume responsibility for fire protection, with fair help from the lumbermen, with laws enough and enforcement officers enough to compel people—lumbermen included—to reduce fire hazards and stop setting fires.

"Under present conditions lumbermen set many fires—perhaps most of them. Watch the logging engines scatter sparks through the forests. Spark arresters? Who has them, where are they, in what condition are they? Who sees that they really are arresting sparks? Who watches the lumbermen?

"So we need fire protection, then selective cutting—with lumbermen voluntarily practicing it or else compelled to do it by legislation. With selective cutting, plus fire prevention, plus good, state fire fighting, we can restore our forests. Otherwise we can not.

"No single lumberman or lumber company can do it. It would be senseless to cut selectively on one tract, saving young trees and keeping new forests coming, only to have the next tract cut without selection, without regard for fire hazards, and thus inevitably sending fire into the selectively cut areas. But, working together, we can bring back the forests and perpetuate the lumber business. And lumbermen can make money doing it—and keep on making money."

And there you are! That is "decreeing a public interest in trees." It means, simply, that the Congress or the states are to say:

"Trees remain private property and you may profit by them, BUT you no longer may destroy the forests. The public needs forests: farmers need them for the sake of the rain they influence and the floods and droughts they prevent; water power companies need them, for the sake of the influence they have on streams; the people need them for their effects on climate, the shelter they offer, the recreational values they have. So cut your trees, make your money, but you are hereby restrained from destroying wantonly, must cut selectively, must save young growth. Thereby you will prosper, but, above all else, thereby you will preserve the public interest in trees upon which we, the people, now insist."

PROFESSIONAL STANDARDS FOR STATE FORESTERS[1]

By M. B. Pratt

President, Association of State Foresters

We are gathered here today to gain fresh inspiration for the work dearest to our hearts—that of Forestry, and to derive from the experiences of others, ideas that may bring us closer together in carrying out the ideals of our profession. Forestry is an ideal, and every state forester, and every member of his organization, should express and interpret that ideal in terms of service to his fellowmen.

It is not my purpose today to review the accomplishments in forestry the past year. We spend long days in our offices over budgets, statistics and reports and we all know that the ideals of the early foresters are rapidly becoming realities. It is my purpose, rather, to discuss the ethical standards which I believe should be the foundation of our duties as state foresters.

When the Teacher of Galilee had fed the thousands, the command was to gather up the fragments into baskets. The thought of another person and another day was behind the command. Foresters must appreciate the need for that same attitude, and approach their problems in as thoughtful and conscientious a manner if they are to measure up to the high responsibilities of their commissions.

As a Rotarian, I have become impressed with the motto of the Rotary Club—"He profits most who serves best," and its Code of Ethics which has as its object the lifting of the level of human ideals and achievements. It is especially fitting that foresters should consider this Code, since we are foresters not because of pecuniary gain, but because we believe the profession of forestry affords us an opportunity to serve our fellowmen. Therefore, I am taking as my text six objects of Rotary.

First Object: To consider my vocation worthy, and as affording me distinct opportunity to serve society.

It has been well said that selfishness is the road to self-destruction and that service to others is the road to self-construction. There are opportunities presented to us as foresters to lend our influence to wildcat schemes having to do with natural resources, and which to the uninformed appear to be legitimate. We may be called upon to sub-

[1]Delivered at the annual meeting of the Association of State Foresters, Sacramento, Calif., October 5, 1925.

scribe to extravagant claims on the production of lumber from some tree, such as eucalyptus, for stock-selling purposes, or write a prospectus for a plant which is stated would revolutionize the rubber industry. We could doubtless improve our financial status by lending ourselves to tree and plant wildcatters, but we would render no distinct service to society by subscribing to propositions unworthy of the dignity of our profession. It is our duty and privilege to give legitimate information to the public through the press, but we should never sanction sensational articles in an effort to gain public favor.

Second Object: To improve myself, increase my efficiency and enlarge my service, and by so doing attest my faith that he profits most who serves best.

As foresters, we are working largely for the interests of future generations, which is a fact that some politicians fail to recognize. Too often our office is regarded by office-seekers as a political plum, and subject to political patronage. We must combat this mistaken idea by the highest quality of service. It is my conviction that the state forester who keeps clear of political entanglements, who improves himself, and who increases his efficiency and that of his force in behalf of public welfare will have little to fear, as a general rule, from political upheavals. On the other hand, nothing will wreck an organization sooner than lack of ethical practice by the one at its head. It behooves each of us to look well to his personnel, and instill in each employee high moral obligations towards the public which he serves. We are the servants of the public, not its masters, and by serving public interests cheerfully and without undue exercise of authority, we will prosper and help others prosper, will grow and help others to grow.

Third Object: To realize that I am a business man and ambitious to succeed, but that I am first an ethical man, and wish no success that is not founded on the highest justice and morality.

Forest protection is a highly specialized business requiring administrative ability of the highest type. At present, it is the chief business of the Western foresters, and I judge still consumes a considerable portion of the energy of the Eastern foresters. Our efficiency, as far as the general public is concerned, is judged by the thoroughness of the business methods which we employ in protecting the forests under our charge against fire. In this connection, we are absolutely dependent upon the actions of the men who constitute our protective

force. It is not enough that these men are good fire-fighters. They must be something more. They must have a high sense of justice and morality, and command the respect and loyalty of the people with whom they are associated. If we are to instill in these men high ideals of service, we must first have high ideals within ourselves. In order to transmit these ideals to our men, it is imperative that we know them well. We can not know them well unless we meet them in their districts and around the camp fire or by their hearth-stones, talk with them as man to man and as friend to friend. I still have the big-family feeling that Gifford Pinchot injected into his organization when a number of us who are here today took our first steps in forestry, and believe that our work as state foresters should be conducted with this feeling uppermost in mind. I believe that better results can be secured by liberal infusion of the milk of human kindness than by the use of the mechanical yardstick of scientific efficiency.

A sympathetic attitude by the "boss" towards all the troubles of the members of his organization, whether these troubles be official or personal, promotes loyalty and effective cooperation. In this connection, it is my opinion that it is a mistake to entwine a ranger with red tape in the way of detailed orders and instructions. He should be given room for plenty of initiative, once he has gotten the idea what his work is all about, and if he reflects his superior's ideas of justice and morality, he will not make any serious mistakes. I do not mean to imply that a ranger should be turned loose to administer a million acres, as many of my men do, without any check on his actions, but rather that he be given an opportunity to work out constructive ideas for his district according to his best judgment without undue interference from the office. Most men will respond to the confidence placed in them, and develop a personal interest in their work, since they know that they will be backed up by their superiors whenever their actions have been carried out in an honorable manner.

Fourth Object: To hold that the exchange of my goods, my service and my ideas for profits is legitimate and ethical, provided that all parties in the exchange are benefited thereby.

The foundation of any successful organization is cooperation which results in the knitting together of the threads of common endeavor into a strong and substantial fabric of accomplishment. As state foresters we have much to do with forestry problems affecting private lands, and are called upon to enforce the state laws regulating certain actions on these lands. Some of us have state lands to administer,

and some of us have more or less to do with the National Forests. In order for the different agencies concerned to exchange their goods, services and ideas to the best advantage, there must be cooperation, else we will have a situation comparable to that at the building of the Tower of Babel where the workmen spoke different languages. Cooperation results in the understanding of the same language. I was much surprised on a recent trip to a logging camp to hear the logging superintendent talk glibly of reproduction, rotation and sustained yield. Twenty years ago such words were not known except to foresters. Now they are used even in cross-word puzzles, all as the result of cooperation. This cooperation has been brought about by everybody concerned getting around the table and discussing their problems in a frank and impartial manner. As a result, it has been found that many of the difficulties have been due to misunderstandings, and the exchange of ideas has been of benefit to all parties. Foresters are no longer like John the Baptist, crying in the wilderness. Their message has a receptive ear nowadays, but let us give our message in a spirit of tolerance with due regard to the rights and privileges of the other fellow, who may not be so bad after all once we come to know him.

Fifth Object: To use my best endeavor to elevate the standards of the vocation in which I am engaged, and to conduct my affairs so that others in my vocation may find it wise, profitable and conducive to happiness to emulate my example.

Every profession, like every man, has a reputation either good, bad or indifferent, and it is the duty of every forester to strive to advance the reputation of his profession to the plane of recognized dignity. Such is the objective of the Society of American Foresters, and such is the objective of the Association of State Foresters.

Public confidence depends upon private conduct. The one great need in the world today above all others is an individual moral and spiritual responsibility. There is one line in Washington's Farewell Address which always stirs me—"Let Us Raise A Standard To Which The Wise And Good May Repair." Fellow foresters, we need more wise and good men in our profession. Are we doing all we can to stimulate young men to follow in our footsteps? If we believe our profession to be of distinct service to mankind, and conducive to happiness for those who follow it, should we not do all in our power to induce boys of the coming generation, to which forestry will be most vital, to make it their life-work?

Sixth Object: To advance understanding and good will through a world fellowship of business and professional men, united in the Rotary ideal of service.

As I stated in the beginning, the Rotary ideal of service is especially applicable to our profession. Even as Rotarians seek a world fellowship, so do foresters seek this fellowship as is evidenced by the World's Forestry Congress which will be held at Rome next year.

The forester's message to the world is one of construction, not one of destruction. Let us not forget our responsibility in measuring up to the high obligations of our commissions. We are practical men and we know that the fight to establish the ideals which we have set ourselves will be a long fight in which there never will be complete victory, but I am confident that many little victories will be won by us, each of which will carry mankind a step toward peace and happiness. Integrity and desire to serve are the essentials, and they are all that mark the difference in life between drudgery and a high adventure with a great reward at the end.

THE GRAPHICAL REPRESENTATION OF FOREST FORM

By Henry I. Baldwin

The Brown Company

In comparisons of stands the use of basal area has been common in the past, and continues in favor as a convenient expression of density, and as an indicator of site quality and yield at a given age. By graphical representation the allotment of basal area to each diameter class can be brought out in a very striking manner, and the effect of various methods of thinning and final cutting on the general forest form noted at a glance.

Forest form diagrams are not new; many methods of showing the relationships of trees in a stand have been devised; but the recent discussion of the merits of semi-selection types of forest, "Dauerwaldwirtschaft" and other methods born of the swing back to natural reproduction in Europe, has stimulated a renewed enthusiasm for forest form graphs. The method described here is that recently advocated by Mundt,[1] who with Muus, Mork-Hansen and others in Denmark represent silvicultural tendencies closely agreeing with Biolley.[2] As Mundt observes, "the traditional terms for silvicultural systems—clear-cutting as against selection, 'Jardinage' and others are too general terms in which to express the disputed nuances in the conception of which forest form, among them all, can best fulfill the ideals of optimum quantity and quality production."[3] This forest form diagrams aid materially in doing.

The only data which are necessary for their construction are the numbers of trees per acre in each diameter class, from which the basal areas for each diameter class can be computed. By plotting these basal areas symmetrically about a vertical axis, the smaller diameter classes at the bottom, as illustrated, the form of the forest may be easily discerned. The scale may be varied to bring out most fully height and diameter growth in different diameter classes, if desired. Where two or more species are considered, they can be plotted separate-

---

[1] Mundt, H.: Grafiske udtryk og taludtryk for skovformen, Skogsvårdsföreningens Tidskrift, Vol. 22, p. 250, 1924.

[2] Biolley, H. E.: L'Aménagement des Forêts par la Méthode expérimentale et spécialement la Méthode du Controle, 1920.

[3] Mundt: loc. cit.

ly on the same or different diagrams, using cross-hatching or colors to indicate the space occupied by each. This may also be done to show the form of the stand before and after cutting. Another method is to use transparent cross-section paper, (the grid known as millimeter paper is a convenient size) where two or more graphs plotted to the same scale may be superimposed, and the forms of the stands compared very readily. Diagrams plotted at different periods in the life of a stand, and after different methods of handling provide a clear picture of what basic changes have occurred.

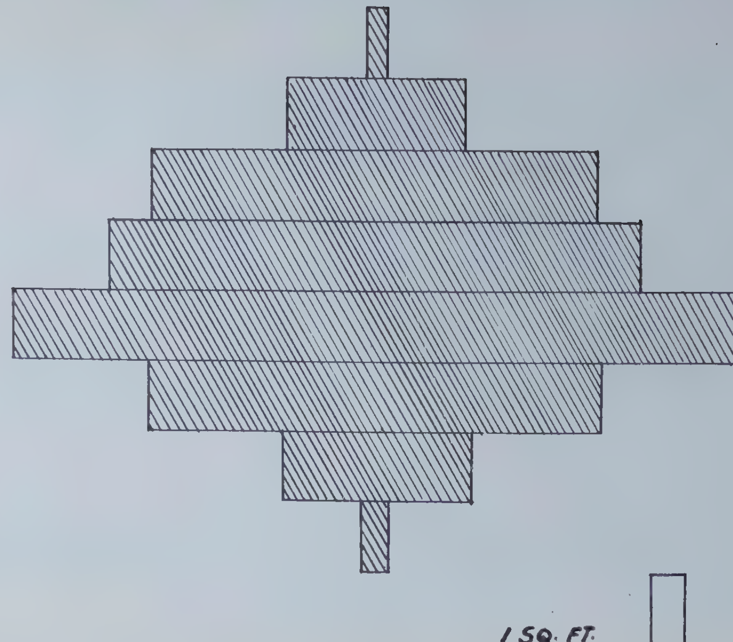
It is surprising how much can be read from a diagram; forest form diagrams show at once whether a stand has a tendency toward the form of a selection forest, or one-storied forest with even crown level. Fig. 1, while not an extreme example, shows that the basal area is concentrated in relatively few diameter classes; this indicates that the stand is quite even, that undergrowth must be lacking; that many trees of the same crown class are competing with one another. The diagram illustrates directly how the crown surface is distributed: it is thin; the crowns are tightly pressed and severe cutting will endanger the stand by making it susceptible to windfall.

In Fig. 2 another condition is depicted. The basal area is distributed more evenly, and through a greater range of d. b. h. classes. The crown cover is evidently broken and wavy; numbers of young trees are struggling up in half-shade, while the large trees have adequate room for expanding their crowns and making rapid diameter growth. Windfall danger with cutting should be less here since the trees with well developed crowns have presumably formed extensive root systems as well. The same applies to danger from sunscald. Clear lumber should be produced here, since young trees will grow straight with slender branches as they reach up toward the upper canopy. Annual rings will be small at first, because of the small crown, and active height growth; then diameter will be laid down on a clear stem.

If we examine the virgin (climax) forest, we shall find conditions to agree essentially with the above. Of course this ideal picture may be marred in any given area by the ruthless crowding, abnormal windfall, insect attacks and other "natural" influences in the virgin forest, but the diagram indicates the fundamental shape of a climax forest where tolerant species may work up from a suppressed beginning to dominant maturity.

FIG. 1

D.B.H.	STEMS PER ACRE	BASAL AREA SQ. FT.
8	2	.70
7	20	5.36
6	64	12.56
5	112	15.28
4	236	20.60
3	264	12.96
2	252	5.48
1	184	.80
Σ	1134	73.74



BALSAM FIR 40 YRS.
MAINE

Virgin Spruce-Hardwood
Maine

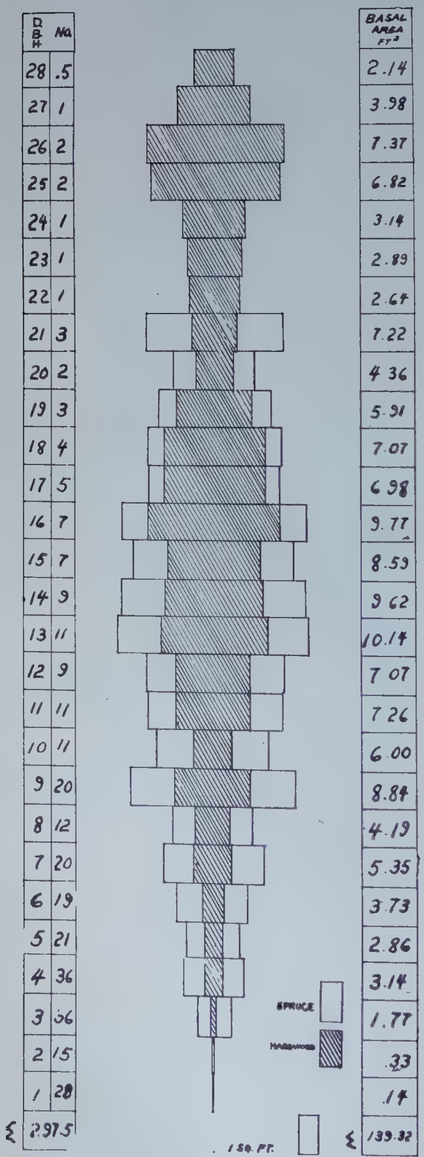


Fig. 2.

Norway Spruce and White Fir
Switzerland

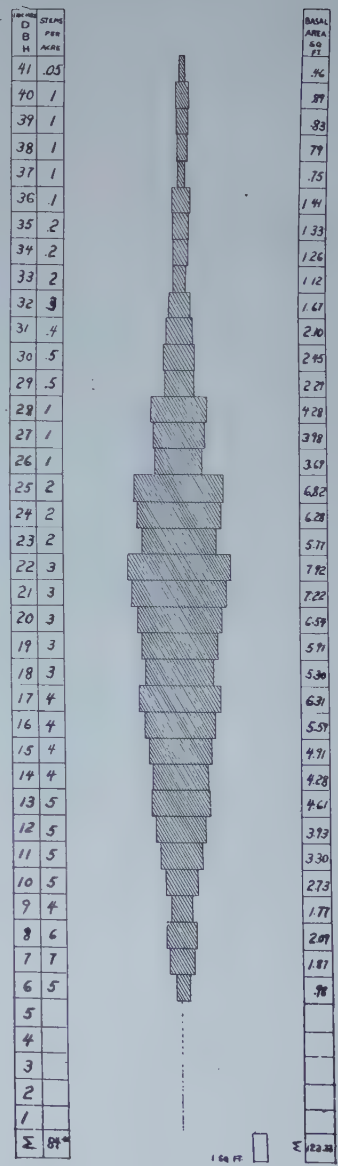


Fig. 3.

That man may aid as well as hinder the attainment of ideal forest form, is illustrated by Fig. 3 plotted from figures from M. Biolley's "Jardinage" in Switzerland. It represents a well-nigh perfect selection form.

As has been touched upon in the foregoing, one of the most valuable uses of the forest form diagram is to illustrate changes brought about by cutting. A useful check on thinnings is to plot figures from sample plots before and after marking; it will show better than figures toward what form of forest the cutting will lead. Thus, in Fig. 2 it will be noticed that with the removal of all softwood above four or five inches d. b. h., as is commonly the practice in the Northeast, the forest is moving toward a more even distribution of basal areas, which may be conceived to be roughly the ideal form of selection forest. At first commendable, the fault lies in the distribution of the cutting as regards species. Under existing treatment the continuation of softwoods in the type is often endangered—and this is a very pressing problem on the very extensive areas of spruce and hardwood lands. Maintenance of conifers in the mixture depends on the presence of adequate seed trees, especially trees with vigorous crowns in the upper story, which have top light, and are capable of producing good crops of seed.

It would appear from this diagram that the untouched climax forest in this type tends toward a flattened ellipsoid form graph. If this be the shape selected by Nature to most fully utilize the site, cutting should be so directed as to work toward the indicated normal forest form; this will consist in light cuttings in all merchantable diameter classes, yet always leaving sufficient to expand into the next higher class. As regards selection of species, their relative value should dictate which should be left, not which should be cut. Cutting should be light, keeping the ground in partial shade; defective trees should be taken first, and salvaged; some softwoods should be left, more hardwood taken in the upper diameter classes—this and more the diagram would indicate.

With existing markets and opportunities for utilization, such a procedure will rarely be possible at the present time, but the search for the ideal method should not languish on this account.

The question of which form of forest is the highest producer, even-aged or uneven-aged, even or irregular, can not be answered directly, nor is in place here, but quality can often be shown to be the product of forests in selection form in the case of tolerant species.

Shade-enduring species starting in the open quite frequently dissipate themselves in profuse branching as in the case of the roadside sugar maple.

The consideration of quality production should be especially fitting on government-owned forests where long rotations can be afforded; but long rotations alone can not produce quality if the forest is not in the proper form. The demand for higher grades may also be an incentive to the private owner; the much-heralded timber famine is already felt in the scarcity of high grade logs in many industries, while second growth white pine box lumber shows little rise in price. Whether quality or quantity will pay best in the future, may be hard to predict, but it is certain that an owner of high grade timber which can bear transportation charges, will have the least difficulty in making a favorable sale. Here again forest form diagrams can give some conception of quality conditions in a stand, and in what direction they are tending.

This discussion makes no claim to have presented any new fact or theory; suggestions have been made more to illustrate the trends which analyses of forest form diagrams may take, rather than to lay down rules for management. To some such theories may well seem "up in the clouds" as far as present day logging is concerned, but as already stated our aim should be to determine what treatment is ideal. Perhaps forest form diagrams may be found of some small help in elucidating our silvicultural problems.

BOOKKEEPING IN FOREST MANAGEMENT

By J. Roeser, Jr.

U. S. Forest Service

In the past few years, forest regulation has received quite an impetus through the construction of revised management plans on most of our National Forests. In preparing these plans, one fact has impressed me more perhaps than any one other, and that is, the character of a suitable form for recording all information necessary for the proper conduct of the regulatory system.

Up until the present time, regulation has fallen short in National Forest management because of two conditions: the failure to construct practicable working plans; and the failure to provide for a definite record of all operations affecting cutting, increment and growing stock. For the latter reason, a form of control book for recording all operations dealing with the production and removal of timber, and their costs, is necessary. This may include, of course, all other lines of activity which are conducted on the forests.

One of the things lacking at the present time in our accounting scheme is a record of the actual cost of growing timber on the National Forests. The interest bogey, as others have pointed out, has scared us in the past and is still scaring us, although many practical foresters are beginnning to feel that compound interest has no place in forest finance under a sustained yield management. Private business practice, in general, including private forest business, expects to and calculates to secure returns which cover, at least, an equitable interest on the investment. In order to encourage systematic forest management on private holdings, and to provide comparable data, it seems to me that we must put ourselves more or less on the same working basis with private enterprise. I do not mean to say that we should make all other objects subsidiary to highest financial gain, but we should apply ordinary accounting methods in calculating costs and revenues in order not to create unfair competition and to put the Forest Service on a more self-sustaining footing. At the present time, our system is rather haphazard and provides no example for private ownership to follow.

The simplest form of accounting would provide a segregation of expenditures as between investment and expenses and also a segrega-

tion of these expenditures as between revenue-producing activities and non-revenue producing activities insofar as possible for each working plan unit. Such segregations as could not be made directly could later be determined by pro-rating on some equitable basis such as the amount spent directly on such activities. Most investments share in the current cost of the object of investment. This current cost is obtained by applying depreciation to the investments, or "writing them off." The current cost of such investments as improvements, timber surveys, management plans would be obtained in this way. Protection costs of timber production would be ascertained by pro-rating the annual cost for this item between the amount cut annually or periodically and the increment. If $10,000 were spent periodically for this item and the cut approximated one-fifth of the periodic yield, $8,000 would be charged to the growing stock as investment and $2,000 as the protection cost of the timber cut. By summarizing the current costs of improvements, management plans and timber surveys, and protection and current costs of making sales and administering them, we would have the total production cost of the timber cut, which may be compared with the receipts therefrom. Such a method of accounting would give the current production cost of the timber being marketed and would also show periodically the cash investment in the working plan unit. It is the information which private undertakings in forestry must establish to know their financial status periodically.

The compounding of investment or expenditures does not enter in, it being figured that the revenue from timber sales on one part of the working circle or forest will cover the interest charge on planting and other investments in another part. With the facts or near-facts apparent, it would be the problem of the management to see that investments and expenditures for a forest or the Forest Service as a whole were kept within such bounds as returns dictated. It would make for an economic and efficient development of the resource. It would go far in assisting in the proper allotment of funds where needed.

While costs and investments would be ascertained for activities that produced no revenue, such as recreation, free special uses, purely watershed protection stands, etc., the costs of such activities would not be charged against timber or other revenue producing activity receipts, but should look entirely for their support from taxation and not from any direct return from other resources that may be administered in connection with them.

Much water has passed under the bridge since the creation of the various National Forests, but the costs of administration are on record back to the origin of the forests and can be fairly well distributed to date. Past and present charges are not so great when viewed in comparison with costs as they will be under the proposed system 50 years from now. The idea is to get a start, and the sooner the better.

Under ordinary business book-keeping methods timber will be valued according to its actual cost value and not purely on its market value. For the time being this means a piling up of capital investment until such time as the working circle or unit is put on a sustained yield basis after which revenue will balance costs plus interest on investment. Among other advantages, such an accounting scheme should help toward personal efficiency, since forest officers will be informed of costs involved in various activities, and will be stimulated to hold these down as much as possible. Furthermore, this system will, I am sure, renew the interest of the average forester in forest finance; an interest now discouraged because the interest complex is usually more than he cares to consider.

The idea of the practicability of using a control book in forest management was impressed upon me by an article appearing in 1922 in a German periodical[1] by Forest-Assessor Wendroth concerning regulation under the so-called continuous form of forest management.

The continuous forest is nothing more than a selection forest in which only mature and decadent material is removed, and in which the soil is kept in a highly productive state. It is managed on the basis of growth and increment; rotation receiving no consideration. Regulation is purely by volume. In order to secure continuity of yield and a survey at all times of the growing stock and increment, a written plan has been adopted in the Forest District of Biesenthal, which to all intents, strikes me as being adaptable in many ways as a record of progress in our National Forests, where the silvicultural system ordinarily employed is the selection form.

The form used by Wendroth includes a set of four pages, and the record of each unit of the working circle is kept on a separate set. Modified to suit our conditions, the general outline is as follows:

---

[1] Wendroth. Betriebsregelung in Dauerwalde. Zeitschr. Forst. u. Jagdw. Pp. 11-22, Volume 54, 1922.

BOOK-KEEPING FORM

PAGE 1

Unit No.______	
Compartment or Unit Map	Forested area______A. Non-Forested Area______A. Total area______A. Soil condition and cover______ ______ ______ ______

DESCRIPTION OF STAND

EXAMPLE.—Southern section: Pine 37-60 years, mostly medium pole size, II (site class); 9 (density of stand on basis of 10); with occasional 50-70-year groups of advance growth and a few 140-year pine and beech veterans. Sporadic irregular clumps of spruce, 10-35 years, understory of poor growth, and occasionally 40-year oaks and beech in understory.

Western section: 5.7 acres pine, $\frac{135\text{-}155}{145}$ years, poor to medium saw logs; in the northern portion good saw logs, III, 6. Understory, especially in the northern portion, considerable reproduction of pine 10-40 years, 0.3 (approximate percentage of area occupied by young growth).

For general purposes, it may be argued that this outline is too detailed to apply to all units of any National Forest or other working circle. We can not, however, escape the fact that we must eventually adopt some scheme for recording the items suggested in the outline, and the above is offered as a suggestion based on a system which is working satisfactorily under European conditions.

The whole value of the outline, it will be seen, depends upon the items contained on Page 3. It is the summary of the actual performance of the growing stock. The periodic increment is considered for a 5 or 10-year period, preferably the former, and is derived as a product of the original growing stock deducted from the present growing stock. This latter is to be determined either from reliable local figures established for any type and location, or from sample plots both in the uncut and cut-over forest. It stands to reason that we can not measure all of our stands, but to get away from conjecturing, some mensuration work should be done in each unit by permanent sample plot or strip survey, so that a fairly accurate figure may be obtained for the growing stock. Under the German system, stands over 20 cms. average d. b. h. are actually calipered on sample plots of .6 acres; those below this diameter limit are computed for volume from yield tables based upon density of stand and average height; 10-20 trees being measured or estimated in every stand or sample plot.

BOOK-KEEPING FORM

PAGE 2

Year or Period	Merchantable Cut (Saw Logs, Ties, Fuel, etc.)					Revenue	Cultural Work							
	Pine	Fir	Other Coni-fers	Hard-woods	Total		Labor on Soil Alone		Sowing		Planting		Thinnings and Cleanings	
							Area	Cost	Area	Cost	Area	Cost	Area	Cost
19____ 19____ 19____		(cu. ft. or bd. ft.)					Acres		Acres		Acres		Acres	
Sum														

BOOK-KEEPING FORM

PAGE 3

	Total Volume in Cubic Feet or Merchantable Timber in Board Feet						Investment
	Pine	Fir	Other Coni-fers	Hard-woods	Total	Per	
(Original) growing stock 19____							
Present growing stock 19____							
Periodic increment							x
Periodic cut							
Total growing stock on hand							xx
+ or — change in period							

x Total costs to be charged against timber during period.

xx Investment equals original investment plus periodic costs assignable to periodic increment. If total revenue exceeds total costs a proportionate part of original investment is either written off or excess of revenue over costs is applied on another unit.

The general application of the sample plot method in this work is very desirable. During the past field season considerable work was accomplished in District 2 in securing growth measurement data by means of strip surveys and the data thus obtained could very well be applied in specific cases. For general purposes, though, the establishment in each unit of a few sample plots in stands of the chief species on representative sites, both in uncut and in stands cut-over under standard timber sale regulations, in order to get increment figures applicable to areas to be cut-over in the future would assist greatly in building up our forest statistical record and would furnish the field force of the Forests an excellent opportunity to acquire fundamental knowledge in forest mensuration and silvicultural practice.

It will be seen that by keeping this record up-to-date, the determination of the proper periodic cut for each unit is only a matter of time, since undercutting or removal of a part of the growing stock will quickly show up in the table. However, overcutting on most of the National Forests in the Rocky Mountain region, or natural working circles within them, is not likely to take place during the present rotation for the lumber demand is still limited, and the cut does not approximate the net increment. This means that a building-up of the growing stock is taking place and that a large part of our costs are going into investment. These Forests are acting as reservoirs, storing up their growing stock to meet the heavier demands of the future, and relieving the pressure on the more important timber producing regions of the South and West.

The German system provides also a Page 4 in the form. This is more or less subsidiary, its object being to provide an index of value increment, as contrasted with the primary volume increment control. In addition to the permanent record of each sample plot it shows the average diameters of the sample plots whenever measured; the differences indicating value fluctuations of the growing stock based on the assumption that an increase in d. b. h. with the same amount of growing stock means that there are less trees bearing the same amount of more valuable timber. By making use of current timber sale prices, this information might be augmented to show actual values and gains due to increasing stumpage. This part of the record is of no great theoretical importance, and I have not included it, but it may have considerable value in the present and future financial management of our forests.

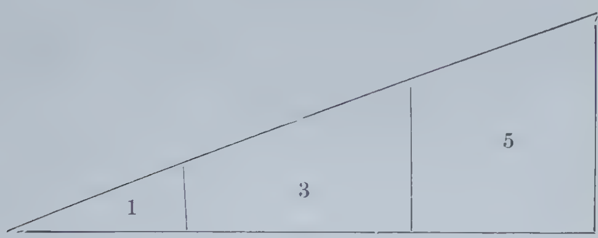
THE FRENCH 1883 METHOD. A GENERALIZED MODIFICATION[1]

By E. A. Smythies

Indian Forest Service

This method is too well known to Indian foresters to require any elaborate or detailed explanation. Put very briefly, the method as applied to selection forests is as follows: The forest is enumerated in diameter classes, the rotation fixed, and the diameter of tree of rotation age determined. Then the growing stock is divided into three classes: (1) old wood 67 per cent and over of rotation age; (2) aver-

Fig. 1.



age wood, 34 per cent to 66 per cent of rotation age; (3) young wood, up to 33 per cent of rotation age (these latter usually not being enumerated). For a normal forest, these three classes should show the volume ratio of 1:3:5; (Fig. 1).

[1]Note: This article was submitted to T. S. Woolsey, Jr., by Mr. E. A. Smythies of the Indian Forest Service. In the letter of transmissal he stated, "In your very clear discussion of the French 1883 method (pages 82-85, American Forest Regulation), you mention one practical drawback, i. e., that trees must be tallied down to one-third rotation age. As this implies varying the enumeration size limit in every rotation and even for every quality class, it is a very decided disadvantage and it should be possible to avoid this difficulty by calculating the general formula of which the 1883 method is a special case. I enclose herewith a copy of a short article which I am sending to the Indian Forester and I should be very interested to hear from you: (1) If anyone in America has already worked this out previously; (2) If in your opinion you think this modification would be of practical utility.

"As far as I have been able to test it out (by drawing to scale), it seems to work satisfactorily."

Before replying to Mr. Smythies, I thought it best to publish this in the Journal of Forestry with the request that members of the profession interested should write me their criticisms or suggestions. As a matter of fact in the United States, the enumeration, if by inch diameter classes, would present no serious difficulty.—T. S. W., Jr.

If there is a normal (or nearly normal) proportion between old and average wood (i. e. 5:3), the annual yield is fixed at the volume of the old wood divided by one-third of the rotation, plus its increment during half that period. If the proportion of old and average wood is distinctly abnormal, necessary adjustment has to be made, e. g. if the proportion was 6:3 sufficient of the old wood would (subject to the predominant claims of silviculture) be transferred to the average wood, or if 4:4 vice-versa. It is unnecessary to explain the method further, since it is fully dealt with in all text books. But in its practical application, there is one difficulty, namely the enumeration of the crop down to one-third rotation age. If this is logically followed, it means that enumerations have to be taken to different limits for every rotation and for every quality class. As an illustration, the following table may be given (obtained from the sal yield for the U. P.)

ENUMERATION OF CROP DOWN TO ONE-THIRD ROTATION AGE

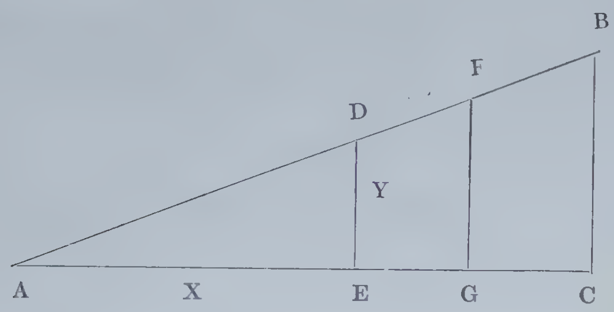
Rotation	I Quality		II Quality		III Quality	
	Rotation Diameter	⅓ Rotation Diameter	Rotation Diameter	⅓ Rotation Diameter	Rotation Diameter	⅓ Rotation Diameter
80	18.5	**7.7**	15.4	**5.6**	12.8	**3.8**
90	20.1	**8.7**	16.8	**6.4**	14.0	**4.5**
100	21.6	**9.5**	18.1	**7.1**	15.2	**5.1**

It is scarcely necessary to emphasize that such a jumble of enumeration limits would be a most difficult matter in actual practice, and in India, working over enormous areas with illiterate and low paid labor it would be impossible. Large scale enumeration work in the U. P. has shown that calipers have to be colored in standard and broad diameter classes, but such variations in enumeration limits would render enumeration work on our standard lines almost impossible. But in this French 1883 method, the fixing of the unmerchantable volume at up to one-third of the rotation is purely arbitrary, and is a special case of a general rule. In the principal U. P. sal forests away from the neighborhood of big cities and intense demand, we regard a diameter of eight inches as the limit of unmerchantable volume, and this diameter will be (for even-aged crops, excluding establishment of seedlings) 27 or 37 or 47 years old according to quality. If, therefore, we can put the underlying idea of the French 1883 method into general terms, and find the proportionate volume between the three classes of

wood where the young or unexploitable wood is up to any fraction of the rotation, we can then enumerate down to a standard diameter (irrespective of rotation or quality) and yet ascertain whether the proportion between the old and average wood is normal or not, and calculate the yield accordingly.

The following is an attempt to obtain the proportionate volume of the three age (or size) classes in general terms.

Fig. 2.



In the usual way (Fig. 2), let ABC represent a normal forest.
AC = corresponding to the rotation = r.
AE = age of unexploitable wood = x.
(In the French 1883 method x of course $= \frac{1}{3}r$).

Also let the exploitable wood be divided equally in two parts (by area or age) at G.

Then, EG = GC = of course $\frac{r-x}{2}$

Also let DE = an unknown y.

Then, volume of young wood = $\triangle ADE = \frac{1}{2}xy$.
the volume of average wood = figure DEGF.
and " " old wood = " FGCB.

We have to find the proportion between these 3 areas.

By similar triangles, $FG = AG \times \frac{y}{x} = \left(x + \frac{r-x}{2}\right) \times \frac{y}{x} = \frac{y}{2x}(r+x)$

Similarly $BC = AC \times \frac{y}{x} = \frac{ry}{x}$

$\triangle = AFG\ \frac{1}{2} FG \times AG = \frac{1}{2}\left\{\frac{y}{2x}(r+x) \times \frac{r+x}{2}\right\} = \frac{y(r+x)^2}{8x}$

$$\triangle = ABC\ \tfrac{1}{2}\,BC.AC = \tfrac{1}{2}\left(\frac{ry}{x} \times r\right) = \frac{yr^2}{2x}$$

$\therefore$ figure DEGF $= \triangle$ AFG $- \triangle$ ADE.

$$= \frac{y\,(r + x)^2}{8x} - \tfrac{1}{2}\,xy = \frac{y}{8x}\,(r + 3x)\,(r-x)$$

and figure FGCB $= \triangle$ ABC $- \triangle$ AFG.

$$= \frac{yr^2}{2x} - \frac{y\,(r + x)^2}{8x} = \frac{y}{8x}\,(3r + x)\,(r-x)$$

hence the proportion we require.
ADE : figure DEFG : figure FGCB.

$$\tfrac{1}{2}xy : \frac{y}{8x}\,(r + 3x)\,(r-x) : \frac{y}{8x}\,(3r + x)\,(r-x)$$

$$4x^2 : (r + 3x)\,(r-x) : (3r + x)\,(r-x)$$

Here we have a simple proportion in terms of two known quantities, r and x, and applicable (in reason) to all values of r and x, and hence applicable to standard diameter limits for enumeration. It looks rather a formidable proportion, but it boils down to very simple figures for any simple proportions between r and x.

For example: Let $x = \tfrac{1}{3}r$.
then the proportionate volumes of the 3 size or age classes

$$4\left(\frac{r}{3}\right)^2 : \left(r + 3\,\frac{r}{3}\right)\left(r - \frac{r}{3}\right) : \left(3r + \frac{r}{3}\right)\left(r - \frac{r}{3}\right)$$

$= 4/9 : 4/3 : 20/9 = 1{:}3{:}5$
which of course is the French 1883 ratio.

Again let $x = \tfrac{1}{2}r$.
then the proportions become

$$4\left(\frac{r}{2}\right)^2 : \left(r + 3\,\frac{r}{2}\right)\left(r - \frac{r}{2}\right) : \left(3r + \frac{r}{2}\right)\left(r - \frac{r}{2}\right)$$

$$= 1 : 5/4 : 7/4 = 4{:}5{:}7$$

Let $x = 1/5r$, and proportion

$$4\left(\frac{r}{5}\right)^2 : \left(r + 3\,\frac{r}{5}\right)\left(r - \frac{r}{5}\right) : \left(3r - \frac{r}{5}\right)\left(r - \frac{r}{5}\right)$$

$$= 1{:}8{:}16$$

Draw these values graphically to scale on sectional paper and it can easily be seen that they are correct proportions. Similarly for other values of x in terms of r.

If this is accepted as correct, it follows that we need no longer bother about enumerating and defining exploitable wood as over one-third rotation age, but we can enumerate down to what actually is exploitable wood in any locality, and having ascertained or determined the rotation and the age x of our enumeration limit, we can divide the enumerated growing stock into two portions and calculate the *normal* proportion between them. If the actual forest is more or less normal, the calculation of the yield then becomes the volume of old wood divided by $\frac{(r-x)}{2}$ years plus its increment for half that period.

If the proportion is not normal, adjustment would have to be made as in the original 1883 method.

Woolsey in his very clear discussion of the 1883 method points out two disadvantages, one of which is "Trees must be tallied down to one-third rotation age." All that is claimed for the modification given above is that it removes this disadvantage, and gives a much freer hand as regards enumeration. It does not remove the necessity for the conception of a *total* volume as compared to a ratio or proportion only. In conclusion I would venture to point out to those foresters in India who consider the application of a little elementary mathematics to forestry is mis-spent energy, that the bulk of our forests in India are still selection forests, for which working plans officers have to prescribe a yield, and where (as is usual) they can not calculate the actual increment of the forest—a very difficult operation under the best of circumstances in a selection forest—they are faced with considerable difficulty in prescribing a *volume* yield, and any efforts to simplify the problem are of some practical importance.

ARTIFICIAL REGENERATION OF WHITE SPRUCE

By R. W. Lyons

Forester, Laurentide Company, Ltd., Quebec

With the continuously growing scarcity of available pulp resources, the governments and the executives of large pulp and paper companies are giving more and more thought to the possible sources of raw material to supply the newsprint for the next generation. It is natural that among other methods the possibilities of artificial regeneration would occur to many.

Therefore the Laurentide Company, having a knowledge of the slow growth in the forests, the large percentage of jack pine and balsam in the second crop, of fungus and insect attacks and of long drives, decided that their large plant investment demanded a certain dependable supplementary supply of raw material. With this end in view, they commenced artificial regeneration experimentally.

Before adopting any planting policy even experimentally, the following elements had to be considered, namely:

1. Land.
2. Species and methods of planting.
3. Administration and protection.
4. Taxes.
5. Thinnings and ultimate yields.

Planting land in Canada naturally falls into two classes, farm lands and exhausted limits with minor conditions such as blow sand, reclaimed lands, etc., which are slightly apart from the problems of the average pulpwood planter. For experimental purposes, the Company preferred the purchase of farm lots.

The next step is the selection of a native tree which will pulp well, show a certain shade tolerance, and regenerate naturally at times in pure stands. Thus, after considerable thought and experimentation, the Company has selected from the list of available native trees white spruce (*Picea canadensis*) as the most satisfactory.

White spruce in nature furnishes a large yield per acre in a short time, is tolerant of shade resulting from the competing hardwoods, and finally shows a partial immunity to the ravages of insects and subsequent diseases. On the other hand, due to its tolerance, it does not clean well; this, while important in lumber production, is not so vital to the success of a pulpwood plantation.

One phase of greatest importance, on which hinges the success of any reforestation project, is the source of seed. When a native species is being regenerated, this factor can be placed under absolute control by the elimination of sites in cone-collection which are non-similar to the one on which the trees will eventually be planted. Experimentally it has not been definitely proven, but it is rather a safe assumption that any considerable difference in latitude or altitude is highly undesirable. Thus seed collection should be made from a more or less restricted area in close proximity to the planting land.

In the selection of trees from which cones are to be picked, those still growing vigorously, with a maximum of crown, are the most suited for the purpose. Such a factor, however, is more or less self-controlled, as the trees which can be most economically picked are in the great majority of cases the most satisfactory from a forestry standpoint,—trees growing in the open with a large crown development. The practice of following logging operations in spruce seed-gathering is dangerous, as collectors are wont to pick insufficiently mature cones from very over-mature trees.

In the nursery, the most economical rotation for our Canadian conditions is two-and-two stock (two years in the seed beds and two years in the transplant rows). Our neighbors to the south prefer a two-year-old seedling followed by one year in the transplant row. The wisdom of this procedure seems open to criticism, as the cost of the final year in the transplant areas never exceeds forty cents per thousand, and the resultant tree is certainly vastly superior.

Due to pressure of spring work the sowing of seed in the nurseries is done in the fall, although equally satisfactory results may be obtained by early spring seeding. The beds are 4 feet wide and 100 feet long; the height depends on moisture and drainage (as we have very heavy rains and snowfall). Seed is sown 3 to 4 pounds per 400 square feet. Having then covered the seed lightly with soil, a layer of sphagnum moss is laid over the bed. Sphagnum has been selected after using a considerable variety of materials such as straw, leaves, canvas and blankets; it is most convenient, acts as a good mulch, and at the same time allows the penetration of rain water and is cheap to obtain. It has also more or less of an antiseptic value, being entirely free of damping-off spores. The crucial stage comes in the spring, as the young seedlings are breaking ground. Great care and considerable judgment must be exercised in the removal of the

moss, especially as germination is never very uniform throughout the beds in spruce.

The care of seed beds for the succeeding two growing seasons is not extremely difficult. The beds are covered with screens giving half-shade for three-quarters of the first summer, and in addition, the use of dryer felt which is strapped across the beds at will is necessary for the protection of the very young seedlings, as the St. Maurice Valley region is subjected to heavy seasonal thunderstorms accompanied by gales of wind. Beds are watered during the evening or at night. Commercial fertilizer can not be used on spruce beds in the same proportions as on pine beds, but if judgment is used and care taken good results are obtained.

In the transplant areas, we have a spacing of ten inches between the rows, with the individual trees three inches apart in the row. The transplanting is done by gangs. A gang has four cabins, the spade crew and rakers. A cabin unit has two threaders and one carrier. The planting instrument is a seven-foot machine modelled after the Yale board. The spade crew are the three men equipped with shovels who make the trench, while the three rakers follow behind them banking in the trees and tramping the earth around the roots. Such a gang will plant over 50,000 seedlings in a nine-hour day. The care of the transplants for the next two years is merely a question of weeding and cultivation.

General preparation of the nursery areas is an application of 20 to 25 tons of green manure, and one ton of powdered limestone, per acre, followed by a soiling crop of buckwheat. The seed beds are treated similarly with the exception that well-rotted manure is used.

PLANTING

Blunders may be made later in the management of the stand, but it is certain that the most serious mistakes can be made and, what is more, will be made in the first setting-out of the trees. It is evident that a tree improperly planted is starting into its plantation life handicapped seriously. Thus it may be stated that a cheap plantation is quite often a dear plantation before the end of the rotation. Therefore, it is our policy to depend entirely on grub-hole planting or hole planting with shovel; using a small wooden contrivance designed to hold the plant in the proper place and at the proper depth while the planter is packing earth around the roots—thus cutting to a minimum the great "don't" of sinking too deeply. In planting farm lands, straight hole planting after

the removal of a square of sod has been satisfactory. The shovel men make holes for two to four planters, depending on the facility of the "going." A line of planters for five or six shovels makes a satisfactory working unit and is about all one foreman can handle to insure good planting.

YIELD

A few years ago, when an attempt was made to calculate our returns from plantations, it was realized how great was the lack of definite knowledge regarding white spruce and the factors influencing it. First of all, the existing literature was based on European rotations, European species, and for saw timber. Nothing was available for the pulpwood planter. With a short rotation in view, we commenced studying crown development and root development in relation to maximum increment. These data which are interesting in themselves become absolutely essential in your future management to produce your maximum crop, and that is what the managers of pulp and paper companies are looking for today. Therefore the yield table given is calculated in accordance with crown development based on actual measurements of trees in the different age classes in close proximity to the planting land, soil conditions and other factors being the same. By using crown as a symbol of growth, we have been able to present practically and logically the number of trees that there should be to an acre in order to insure the maximum increment in a stated time. The ages given in the table were obtained by taking borings 18 inches above the ground, and as 3 years are needed in our plantations to reach 18 inches, (allowed for stump) 3 years were added to the age.

In the plantations we commence with 1,700 to 2,000 trees per acre, according to whether the planting is on brush land or sod. In brush-land planting we make a cleaning or weeding at the end of 5 years, but no thinnings are attempted until the trees have reached the age of 15 years. At this age suppression will be creeping into the stand and lowering the yield. Therefore, the next 5 years will see a great percentage of the trees removed through suppression. The first returns will come from the 25-year-old stand; in this thinning the growth of the trees removed is considered as being suppressed and they are therefore measured as belonging to the 20-year old class. However, at the same time the number of trees per acre is reduced to what the stand

WHITE SPRUCE YIELD PER ACRE

Age	Stump Diam. (18″)	D. B. H.	Height	Crown Width	Crown Area	Number of trees per acre	Number of trees to be removed [1]	Volume of each tree	Total Volume	Current yield per acre from Thinnings	Yield of Rotation
years	ins.	ins.	ft.	ft.	sq. ft.			cu. ft.	cords	cords	cords
20	4.3	3.5	15	8	50.25	866	481	.536	2.86		
25	7.5	6.5	24	12	113.04	385	139	2.53	3.90	6.77	
30	10.7	9.4	30	15	176.68	246	30	6.26	2.08		17.13
35	13.	11.	35	16	201.02	216	45	9.68	4.84	6.93	
40	14.6	12.2	40	18	254.44	171	18	13.26	2.65		25.30
45	16.	13.5	45	19	283.53	153	14	17.99	2.78	5.43	
50	17.5	15.1	50	20	314.21	139		24.78[2]			38.3

(1) Actual removals are made at ages 25, 35 and 45, but the more suppressed trees removed at each time are considered as having the volumes of trees 5 years younger; hence the division into 2 groups.

(2) Rate of growth percent for last ten years = 8.6
Volume of tree at 40 years—13.26 cu. ft.
Volume of tree at 50 years—24.78 cu. ft.

Difference +11.52 cu. ft.

should be at 30 years, and these trees which are normal are measured as belonging to the 25-year-old class. In doing this, a stand is left in a good growing condition, and absolutely free of any suppression. Furthermore in the thinning at the end of the 35-year period, the trees removed would have only 5 years' suppression. The last thinning at 45 years is optional; it is more or less a preparatory cutting to establish reproduction before the final cut.

Coming now to the forested areas, at present being managed, we have stands of old hardwood, white birch and poplar, 20 to 40 years old, mature spruce and balsam, also coniferous reproduction. The old hardwood areas present a very complicated proposition, as the cost of preparation will be heavy if the material salvaged can not be disposed of. However, there is usually a fair sprinkling of reproduction and advanced growth, which augmented by "plants" make an excellent stand, its very being and safety increased by the heterogeneous mixture that usually results. Such a mixture is not a menace to the tolerant white spruce and most of the offending varieties may be removed, as cleanings or thinnings.

Thinking in terms of pulpwood, the white birch stands are thinned with the object of permitting the best to run on to be a crop, and underplanted with white spruce. The shelterwood of young birch will not retard the growth of the spruce seriously and will increase the early earnings. It also does away with that proverbial "ghost" stalking on the path of any silvicultural enterprise, "clean cutting."

In the softwood stands, we have one of the easiest to reproduce naturally. In fact, the future crop is assured under almost any system of cutting. However, to my mind, the one question arises after the reproduction has been established, how can we make it produce to its full productive capacity? We are attempting as far as costs will allow, experiments to ascertain the requirements of the species, thinnings and growth. So far, we have found that natural regeneration has to be continually aided from the beginning and can not pass a certain height without having been thinned once if not twice, to produce the maximum. On the other hand, if the stand is left until it reaches the age of 25 or 30 years, you will have in a great many cases a stand that is very difficult to thin without opening up for fungus diseases which are going to offset any additional growth.

One other phase of the work is direct seeding. Our experience in this dates back to 1920, in which year we experimented in broadcast seeding and in seed spots. By the broadcasting method we obtained a

scattered stand, and the trees now after five growing seasons resemble our 3-year-old transplants in the nursery. The seed spot results were negative. Besides results obtained, further experiments have shown that this practice is not applicable to all sites with spruce, and it is too expensive for the uncertainty of the issue.

In conclusion, I wish to emphasize that the foregoing paper has been prepared not to present the argumentative side, but purely to give you the results of our experience; and also to bring out and present forcibly the great importance of yield in any regeneration problem, whether it be by natural means or by planting.

"Contribution à la connaissance de l'influence des peuplements de Hêtre, d'Epicéa, et des peuplements mélangés sur quelques propriétés chimiques et biochimiques du sol forestier." (A contribution to the knowledge of the influence of stands of beech, spruce and of mixed stands on certain chemical and biochemical properties of forest soil.) By Karel Kvapil and A. Nemec. Revue des Eaux et Forêts, Vol. LXIII, No. 2, Feb., 1925, p. 4-59.

The stands studied were 80 years old located in Bohemia near Càslav on igneous rock formation overlaid by a sandy clay soil. The samples were taken only a few meters apart so that the differences are believed to be due to the differences of forest cover.

Mechanical analysis of the mineral soil to a depth of 35 cm. which passed through a .2 mm. sieve by Kopecky's method gave the following results:

MECHANICAL ANALYSIS OF SOIL

Stand	Size of the soil particles in cu. mm.			
	Less than .01	.01—.05	.05—.1	.1—.2
Beech	35.76	25.32	12.18	26.74
Spruce	35.08	32.26	12.66	20.00
Mixed	35.56	23.12	12.94	28.38

The spruce soil contains a larger amount of fine particles (.01-.05 mm.) than the others. The mixed soil has the largest content of sand (.1-.2 mm.) while the spruce soil is much lower than the beech in this respect. These facts correspond with physical properties of the soils, especially with the porosity and air space.

The physical analysis was made on 100 ccm. of soil, removed with its natural structure.

PHYSICAL PROPERTIES

Stand	Specific Gravity	Volume Weight	Porosity	Water Capacity		Air Capacity	
				Absolute	Proportional	Absolute	Proportional
Beech	2.615	1.049	59.85	37.48	28.11	22.37	31.74
Spruce	2.553	1.213	52.46	37.23	22.62	15.23	24.84
Mixed	2.595	1.086	58.12	31.39	24.64	26.73	33.48

The volume-weight of the spruce soil is greater than that of the others. The beech soil has the greatest porosity, while the maximum air capacity is found in the mixed soil and the minimum in the spruce

soil. The maximum water capacity is in the beech soil. One may conclude therefore that the physical properties of the mineral soils under the mixed and beech stands are much more favorable than those under spruce. Moreover, they are more favorable for chemical action owing to the more free access of air.

CHEMICAL PROPERTIES

Stand	Water Content	Quantity of mineral substance extracted by 10% HCl from air dry soil							Organic Matter
		P_2O_5	K_2O	SO_3	CaO	MgO	Fe_2O_3	Al_2O_3	%
Beech........	13.32	0.198	0.034	0.390	0.102	0.131	1.960	3.561	4.73
Spruce........	7.29	0.005	0.020	2.430	0.075	T	1.920	2.808	1.58
Mixed........	14.81	0.123	0.040	2.300	0.160	0.130	2.356	4.560	4.89

The spruce soil contained the least P_2O_5, K_2O, CaO, and MgO; also decidedly less Al_2O_3. SO_3 was present in considerable amounts in the spruce and mixed soils, in contrast with the small amount under the beech stand. The spruce soil contained much less hygroscopic water than the others and was less rich in organic matter. It was noted that the layer of mineral soil colored by the products of the decomposition of the humus was almost twice as thick under the mixed stand as under the spruce.

NITROGENOUS MATERIALS

Stand		Total Nitrogen % in Air Dry Soil	% of Total Nitrogen		
			Soluble in Concentrated HCl	As Amides	As Diamine Acids
Beech	Humus......	0.727	87.32	14.58	11.35
	Mineral.....	0.201	.....	.....	.....
Spruce	Humus......	1.002	82.01	11.65	10.97
	Mineral.....	0.158	.....	.....	.....
Mixed	Humus......	1.189	88.04	13.40	11.36
	Mineral.....	0.240	.....	.....	.....

In total nitrogen, the beech humus was less rich than the other two. Although the spruce humus had considerable nitrogen the mineral soil beneath it was least well supplied. The three forms of nitrogen easily soluble and assimilable by plants and trees were least well represented in the spruce humus which was considered less favorable to tree growth as far as nitrogen nutrition is concerned.

The degree of acidity of humus and mineral soils was determined by Michaëli's colorimetric method.

ACIDITY OF HUMUS AND MINERAL SOILS

Stand		Acidity Expressed in cu. cm. of N/100 NaOH	PH		KCl Extract Contains in 100cc. in mg		Catalytic Power	
			Active	Converted "è-changèe"	Fe_2O_3	Al_2O_3	5 gr.	1 gr.
Beech	Humus...	1.9	5.90	4.35	4.40	74.40	...	68.7
	Mineral..	16.7	5.95	3.90	0.80	14.20	74.5	4.6
Spruce	Humus...	3.1	4.60	3.85	2.00	118.80	...	29.2
	Mineral..	17.15	5.65	3.70	2.16	6.97	11.5	3.9
Mixed	Humus...	1.20	5.00	4.60	2.25	41.00	...	41.4
	Mineral..	7.9	6.20	4.25	1.50	53.70	71.5	21.2

The acidity of the mixed humus was lowest and of the spruce, highest. In the mineral soil, the mixed gave a less acid reaction than the beech; while the spruce remained the most acid.

The degrees of acidity, "échangée," determined in the soil extract with a normal solution of potassium chloride, were similar. The amount of Al in the humus extract with KCl increases with the increasing value of the acidity "échangée." But, in the mineral soil from the spruce stand, in spite of the high acid reaction, the extract showed the lowest Al content. The strongly acid reaction of the spruce mineral soil was probably due to the large amount of sulphuric acid in the soil.

Comparing the acidity of the humus with that of the underlying mineral soil, no significant difference was found under the beech forest; while under the mixed forest, the humus was more acid than the mineral soil, and the difference was still more marked under the spruce. The beneficial effect therefore of mixing beech with spruce on the soil acidity, is more marked in the mineral soil than in the humus.

The catalytic activity in the humus is greatest under the beech forest and least under the spruce. The relative intensity of the decomposition of H_2O_2 was tested also in the mineral soils, in which the mixed soil was almost as great as the beech. Catalysis therefore also shows the favorable result of mixed forest of broad-leaves with conifers, and that the benefit is more marked in the mineral soil.

BIOCHEMICAL PROPERTIES

The intensity of ammonification was studied by determining the amount of ammonia released from a 1 per cent solution of peptone after 92 hours' digestion. The results are shown in the following table.

INTENSITY OF AMMONIFICATION

Stand		Nitrogen in mg Released as Ammonia		
		Control	Experiment	Difference
Beech	Humus	6.33	78.40	72.07
	Mineral	2.01	37.45	35.44
Spruce	Humus	4.93	117.07	112.14
	Mineral	1.58	21.00	19.42
Mixed	Humus	2.45	81.90	79.45
	Mineral	2.02	77.35	75.33

Ammonification in the humus is greatest in the spruce. The humus, with higher acidity and more organic matter than the mineral soil, has a higher rate of ammonification. In the mineral soils, however, the process was most active in the mixed and least in the spruce.

The intensity of fixation of atmospheric nitrogen was studied by the method of physiological grouping in a liquid medium of Remy.

FIXATION OF ATMOSPHERIC NITROGEN

Stand		Total Nitrogen in 100 g. of Soil in mg			
		Control	Experiment After 30 Days	Difference	Gain in Nitrogen %
Beech	Humus	727.0	1,806.50	1,079.50	+148.5
	Mineral	230.0	294.0	64.00	+ 27.8
Spruce	Humus	1,060.0	1,183.0	123.00	+ 11.6
	Mineral	209.4	183.0	—26.4	Loss
Mixed	Humus	1,188.0	1,654.2	466.20	+ 39.2
	Mineral	319.0	477.0	158.0	+ 49.5

The highest gain in nitrogen was found in the beech humus and the lowest in the spruce. In the mineral soil, the mixed stand fixed the most nitrogen. The mineral soil of the spruce forest showed a loss of nitrogen, probably the result of denitrification. The results indicate better conditions of soil under the beech and mixed forests, than under the spruce.

The intensity of absorption of phosphoric acid was studied by Petit's method in tubes containing 125 g. of humus or soil, through which 150 ccm. of calcium phosphate solution (15.1 g. $CaH_4(PO_4)_2 \cdot H_2O$ to 1,200 ccm. H_2O) were filtered. After 30 days, the amount of P_2O_5 in the filtrate was determined, after having washed the soil with distilled water. The volume of filtrate and wash water was reduced to 500 ccm. The results in the following table give the quantity of phosphoric acid in 150 ccm. of the solution after absorption.

ABSORPTION OF PHOSPHORIC ACID

Stand		P_2O_5 in mg		Absorption of P_2O_5, %
		In the Filtrate	Absorbed	
Beech	Humus	634.00	695.0	52.3
	Mineral	406.98	922.0	69.4
Spruce	Humus	1,107.39	221.6	16.6
	Mineral	484.80	844.2	63.5
Mixed	Humus	730.40	598.6	45.0
	Mineral	345.00	984.1	74.1

The humus of the spruce stand retained the least P_2O_5. The mineral soil of the mixed stand which had the greatest capacity for hygroscopic water and therefore the greatest surface area of the soil particles, retained the most P_2O_5, due to physical, chemical and biological absorption. The more acid is the humus or mineral soil, the less the absorption of P_2O_5. Again, the soil conditions under the mixed and beech stands are better than those under the spruce.

Tests of the decomposition of cellulose were made by Harald Christensen's method. The humus of the different stands did not produce important differences in the decomposition of filter-paper. The mineral soil of the mixed stand and of the beech, however, gave more rapid decomposition than that of the spruce.

INTENSITY OF FERMENTATION OF ORGANIC MATERIALS BY IVANOFF'S METHOD

Time in Hours	Stand		
	Beech	Spruce	Mixed
33	3	7	8
47	42	7	35
49	52	7	40
51	59	6	41
53	65	5	43
55	69	2	45
73	79	0	65
75	86	5	74
76	91	8	78
78	..	17	89
80	..	26	103
81	..	35	113
82	..	42	125

The release of volatile products was less in and even retarded by the spruce soil in comparison with the other mineral soils. The soil of the mixed stand showed the greatest regularity in the process. Sup-

posing that, under favorable soil conditions, the volatilization of carbonaceous materials proceeds quickly, the beech and mixed soils offer the better conditions for decomposition of organic constituents.

The intensity of the light in the stands was measured with Wiesner's photometer with the following results.

INTENSITY OF LIGHT

Stand	Light Intensity in Bunsen-Roscol Units	Light % by Comparison With Full Light in the Open
Beech	0.00492	11.91
Spruce	0.00323	7.82
Mixed	0.00605	14.65
Open	0.04130	100.00

The soil under the mixed stand was exposed to the greatest (insolation) light intensity and that under the spruce to the least. The light intensity is an important factor in the biochemical processes.

The general conclusions are drawn that a pure stand of beech has a beneficial effect upon the forest soil, due not only to the character and composition of the humus, but also to the physical, biological and biochemical conditions of the mineral soil. On the contrary, a pure stand of spruce is unfavorable to the physical, chemical and biochemical properties of the forest soil. The mixed stand of the two species is favorable to the forest soil, especially to the physical condition and to the biochemical processes which go on in the soil. The beneficial action is more pronounced in the mineral soil than in the humus.

BIBLIOGRAPHY

(1) BUHLER: Waldbau.
(2) RĀMANN: Bodenkunde.
(3) FRANCE: Das Edaphon (Stuttgart, 1924).
(4) JOLYET: Traite de sylviculture.
(5) KOPECKY: Roztridovani a oznacovani zemin a pud (Prague). Fysikalni vlastnosti pudni (Prague).
(6) NEMEC ET KVAPIL: Etudes biochimiques des sols forestiers. Comptes rendus Acad. Sciences, Paris, 176, 260 (1923).
(7) NEMEC ET KVAPIL: Biochemische Studien uber die Aziditat der Walboden. Zeitschr. f. Forst-u Jagdwesen, 56, 323-352 (1924).
(8) NEMEC ET KVAPIL: Sur l'intenste de l'assimilation de l'azote atmospherique par les sols forestiers. Comptes rendus Soc. Biologique de France, 1924.
(9) PETIT: Comptes rendus Acad. Sciences, Paris, 154, 1317 (1911) 155, 921 (1912).

J. KITTREDGE, JR.

"The Distribution of Lignin in Wood," by Geo. J. Ritter, U. S. Forest Products Laboratory. Presented before the Division of Cellulose Chemistry at the 69th Meeting of the American Chemical Society, Baltimore, Maryland, 1925.

Although the idea that the middle lamella in woody structures is composed largely of lignin is not entirely new as the introduction of this paper might indicate, nevertheless the evidence submitted to substantiate the idea leaves little room for doubt in regard to its accuracy.

It would pay even those who are not primarily interested in the chemical composition of wood to read this paper in order to acquaint themselves of the possibilities of combining microscopic and chemical methods and procedures in solving certain problems of a very complex nature. Botanists who still consider the middle lamella *always* to consist of a pectin substance should be extremely interested in Ritter's contribution to the subject.

The evidence submitted indicates that approximately 75 per cent of the total lignin found in wood is located in the middle lamella and 25 per cent in the outer layers of the cell wall. The author, however, accepts these figures only with certain reservations.

The lignin of the middle lamella shows structural form, the cell wall lignin an amorphous character. The middle lamella lignin is light brown in color and the cell wall lignin almost black. The difference in the methoxyl content of the two types of lignin indicates that the middle lamella lignin also differs chemically from the cell wall lignin. In red alder, for example, the middle lamella lignin has a methoxyl content of 13.6 per cent, the cell wall lignin 4.8 per cent. In Western white pine the middle lamella lignin has a methoxyl content of 10.8 per cent, the cell wall lignin 4.3 per cent.

H. S.

"An Effect of Drought in the Forests of the Sierra Nevada," by E. P. Meinecke, Phytopathology, Vol. 15, No. 9, September, 1925, pages 549-553.

This article deals with the observation made by the writer on a large timber-sale area on which an alarming loss of seed trees was reported after the unusually dry year of 1923-24.

After considering the possibility of accounting for the damage on the basis of insect attack, fungi and lightning, the writer concludes that in all probability the damage was caused by the unprecedented drought prevailing in 1924 acting in conjunction with unfavorable local conditions such as more or less isolated rock pockets which are quite common in the region.

The survival of incense cedar under conditions apparently identical with those which proved fatal to the sugar pine, Western yellow pine, white fir, and Douglas fir is unexplained, but the suggestion is made that probably the incense cedar is better able to adapt itself to adverse conditions than are the other species found in the area.

HENRY SCHMITZ.

"The Felled Tree Trunk as an Ecological Unit," by S. A. Graham, Ecology, Vol. 6, No. 4, October, 1925, pp. 397-411.

This exceedingly interesting article deals with the succession of insects which attack logs left in the woods under varying conditions. The experiment was started in 1920 and includes logs of white, Norway and jack pine, white spruce, and balsam fir. About thirty logs of each species were taken each year. These were divided into five groups. The first was covered with brush. The second, third, and fourth were covered with lath shades excluding respectively ¾, ½, and ⅓ sunlight. The fifth was left unprotected in the open. The logs were placed lying north and south with the north end raised slightly. This allowed for varying conditions of moisture. The following records were taken: (1) Subcortical temperature; (2) Air temperature; (3) Relative humidity; (4) Evaporative power of air. At the end of each season counts of emergence holes were made, and at the end of the fourth season a vertical section was sawed from each log and the larvel tunnels examined.

The results of the study show that there is a definite succession of organisms as the chemical and physical character of the wood changes, beginning with the xylophagous forms and ending with organisms characteristic of the forest duff, the second stage insects depending upon the primary ones to modify the food materials for their use and so on down through the series. The distribution of the insects in the logs is regulated by many factors such as food, moisture, and temperature with minor factors such as character of bark and density of wood entering into the maelstrom of life.

It was found that the moisture content of the logs varied from day to day, depending largely upon atmospheric conditions, and that the prevalence of the two most important wood borers increased as the moisture content increased. The subcortical temperature of the logs showed a far wider fluctuation than that of the air. At night and on cloudy days the temperature within the log becomes approximately that of the surrounding air. In the sun the subcortical temperature on the upper side of white pine logs very frequently far exceeds the fatal

temperature of all log inhabiting insects. The temperature on the underside follows very closely that of the air. The distribution of the different species is governed largely by temperature. Many insects found only on the lower side of logs in the sun occur on all sides of logs in shade. Full shade was found to reduce the amount of infestation of most insects, and the rate of development of woodboring species.

The information obtained in this study emphasizes the advisability of keeping logs in the shade, and the possibility of saving a large amount of high grade material through the intelligent sawing of logs by taking into consideration the localization of injury.

H. B. P.

"Ten Years of Management of Cornell University Woodlots," by A. B. Recknagel, Cornell Extension Bulletin No. 113, 27 pp., Ithaca, N. Y., June, 1925.

With over 150 million acres of our forests in farm woodlots the problem of efficient production on them is one of great importance. The detailed study of these problems should be initiated in many localities. Therefore the issuance of this publication and the operations it records are timely. It reports the results of management of nine parcels aggregating 79.18 acres of woods under control of Cornell University. Since 1913 these have been managed by the Cornell Department of Forestry which has cut an average of one-half cord per acre for the decade leaving the stocking approximately what it was ten years ago. Hence the stand cut virtually equalled the growth. Since mostly over mature trees were cut the growing stock has been improved in quality. Some planting has also been carried on so that it is calculated the growth will be much greater in the ensuing decade. The prescribed cut for the next decade only calls for the same yield however, so that the growing stock should increase in volume. Obviously some years must elapse to realize the full results of management and hence the full value of the demonstration of improved management. In the management aesthetic values receive full consideration as they should also in all farm properties. The yield consists of hardwood fuel and pine and hemlock saw timber. Natural regeneration is relied upon chiefly.

B. P. K.

"The Phomopsis Disease of Conifers," by Malcolm Wilson. Bul. 6, Forestry Commission, London, 1925, 34 pages, 12 plates.

This bulletin which deals with the dreaded Douglas fir canker, *Phomopsis pseudotsugae* Wilson, should be of particular interest to American foresters on account of the great commercial importance of

the principal host—Douglas fir. Although *Phomopsis pseudotsugae* can not yet be ranked among the fungi which cause serious epidemics among forest trees, it has, however, caused enough damage to warrant the taking of precautions against its spread.

The author following the usual European custom recognizes two species of Douglas fir, namely: the green variety, *Pseudotsuga douglasii* Carr., and the blue variety, *Pseudotsuga glauca* Mayr. The disease has been found on both forms, but no definite information concerning the relative susceptibility of the two species is at present available.

In addition to these two forms of Douglas fir, the disease has also been found on the Japanese larch, *Larix leptolepis* Murr; European larch, *Larix europaea* D. C., and *Abies grandis* Lindl. Injury similar to that caused by *Phomopsis pseudotsugae* was also found on *Abies pectinata* D. C., *Tsuga albertiana* Sénéc, and *Tsuga sieboldi* Carr, but it is not at present certain whether in these cases the damage has been caused by the disease in question. It appears that three distinct fungi have been associated with the disease of conifers in England, namely: *Phoma pithya* Sacc., *Phoma abietina* Hartig. and *Phomopsis pseudotsugae* Wilson. The last is apparently the true cause of the Douglas fir canker, and the synonymy and relationships of this fungus are discussed in detail.

The fungus causes two main types of injuries. First, die back of the shoot, and second, cankers of the stem. The actual seat of the infection in both cases is frequently on the young shoot close to its apex, but the resultant disease depends on the relative position of the attached shoot on the tree. If the leading shoot, or the terminal shoot, of a large lateral branch becomes infected near its apex, the result is the first type of injury; whereas if the upper part of a small lateral branch becomes infected and the mycelium spreads downward through it and enters the tissues of the main stem in which it spreads upwards, downwards and laterally a stem canker is produced. Infection may also take place on a branch on which bark has developed as a result of the injury. Infection due to injury is of quite common occurrence, especially on the trunks of trees from which the lateral branches have recently been pruned off.

Only provisional and for the most part indirect control measures are suggested. The most important of these control measures are the use of uninfected nursery stock, the prevention of damage by animals, insects, and mechanical injury resulting from transplanting and the

exercise of care in pruning off the branches of young trees up to 20 years old. Only dead branches should be removed in pruning.

The bulletin is well illustrated and an extensive bibliography is appended.

HENRY SCHMITZ.

"Effects of Forest Fires on Land Clearing and Crop Production," by M. J. Thompson, University of Minnesota, Agricultural Experiment Station, Bulletin 220, p. 23, St. Paul, Minnesota, May, 1925.

Studies of the effect of the forest fire of the fall of 1918 on the labor and cost of clearing land and on the yield of crops from that land as compared with the costs and yields on similar adjacent unburned land, are reported in this bulletin. The work was carried on at the Northeast Substation of the Minnesota Agricultural Experiment Station, 7 miles northeast of Duluth. The land consisted of a stony, clay loam soil on which balsam, paper birch, pine, and tamarack were the predominating species. The bulk of the report is concerned with the details of labor, methods and costs of the different parts of land clearing operations; namely, brushing—stumping and breaking-stoning. Savings of from 15 to 60 per cent in the different parts of the land clearing operations were found to result from the fire.

Crops grown on the severely burned virgin soil as compared with the same crops on unburned soil of otherwise similar character, for a period of 5 years from 1920 through 1924, showed distinctly lower yields of oats, hay, and potatoes on the burned area and slightly higher yields of sunflowers. The reductions in the yields of the first three crops vary from 10 to 40 per cent. The conclusion is drawn that the "destruction of humus and the reduction or suspension of bacterial action for a time by the forest fire will account, in part at least, for the decreased relative production."

J. K.

"Moderna huggningsformer tillämpade på Finspong." (Adaptations of modern cutting methods at Finspong) by Alf Alarik. Skogen 12:211-243, 1925.

In this report of a successful experiment on a large scale in securing natural reproduction nothing radically new is presented to those familiar with the system of border cuttings as developed by Prof. Chris. Wagner in his *"Der Blendersaumschlag und sein System."* It is, however, most interesting to observe the success with which this method has been applied on the lands of the Fiskeby Co., one of the large pulp and lumber companies of Sweden.

As a silvicultural system, border cuttings partake of the nature of both shelterwood and clear-cutting. Their object is to protect the area to be reproduced from the heat and dryness resulting from complete exposure to the sun and wind; and to avoid windfall. A strip, less than 100 to over 150 ft. in width, is cleared in a direction perpendicular to the prevailing winds (west in this case) leaving mature forest on the south and west sides. These edges, in turn, are thinned lightly to stimulate crown development and thereby seed production. In the mixed spruce and pine forests of central Sweden, a good stocking of spruce is obtained if the soil is in proper condition, but a thorough ground preparation, or hacking of the soil is usually done to improve the seedbed for pine. In subsequent cuttings, in seed years if possible, the border is moved back, proceeding toward the west and south. An essential feature is the provision for an outlet for the wind on the east, and preferably on the north. This may be simply an area of young forest, or a "canal" cut for letting out dangerous gusts. To obtain the optimum conditions for reproduction found in corners of uncut stands, use is made of an echelon or step-like line in marking out the cuttings. However, reproduction areas must be fitted into the topography and no hard and fast rule followed.

The Fiskeby Co. has apparently found that this method is effective in securing dense reproduction, while relatively cheap, due to the concentration of logging. Although the present belief among American foresters is that European methods of silviculture are not directly applicable to our conditions, yet it is possible to glean a few points which may be of value. Perhaps natural reproduction may be found too easy to secure here to require such intensive measures; but Hartley, Bates, Toumey and others have shown the dangers to young seedlings of too strong heating. Furthermore special care is needed in this country if we are to escape excessive windfall. A study of the airplane photographs with which the article is illustrated should repay even those not familiar with the language of the text.

H. I. B.

NOTES

IMPORTANT ANNOUNCEMENT

PROPOSED CHANGE IN THE SUBSCRIPTION PRICE OF THE JOURNAL

In the September-October issue of the Journal of Forestry, in the discussion of its finances, a suggestion was made as to the desirability of increasing the budget of the Journal by raising the subscription price from $4 to $5 and by a larger appropriation from the Society itself. This matter will be taken up by the Executive Council of the Society at its meeting in Madison, Wisconsin, December 14 and 15. While no definite decision can be forecasted at present as to what action the Executive Council might take, it is only fair to announce at this time to all our subscribers that a raise in the subscription price of the Journal from $4 to $5 is not improbable beginning January 1st.

If such an increase takes place, all our friends must realize that it is done only for the purpose of making the Journal a more useful and influential organ for the building up of the profession and for the exchange of professional ideas. It is the only technical forest organ in North America and as such should be maintained on the highest plane of technical quality and printers' make-up, in keeping with the vastness of our resources and the importance of our profession. It is all for the glory of forestry.

Conference of Forest Schools

The initial move to make this conference possible was made in Washington, D. C., last December. During the meeting of the Deans of the various Forest Schools an invitation was extended to those present to visit the Forest Products Laboratory. In view of the fact that the American Forestry Association had scheduled its meeting to be held in Chicago, Illinois, during the latter part of January, it was thought that many school men would avail themselves of this opportunity and visit the laboratory. The date for the meeting was set for January 26, 1925.

It was the hope of the laboratory officials that a sufficiently representative group would assemble on this occasion so that they might act as an informal committee to devise ways or means and make recommendations for more definite co-operation between the schools and the laboratory, to their mutual benefit. This informal group finally suggested a conference of Forest School men, especially interested in

utilization, to be held at the laboratory at a time found convenient to the greatest number.

Later in the year a representative of the laboratory visited a large number of the Forest Schools, in the Middle West and East. The idea of such a conference was further discussed. Finally Director C. P. Winslow felt that interest was general enough and keen enough to make such a conference worth while.

A questionnaire was sent to the various schools to determine a convenient date and a desirable subject for discussion. As a result the conference was scheduled for August 31 to September 5. From the subjects proposed for discussion the "Seasoning of Lumber" was selected by the largest number of schools. A program was accordingly arranged.

The conference opened on the appointed day and hour. Twelve were present representing eight Forest Schools, and a representative from the Forest Products Laboratory of Canada. Each day was divided into seven lecture periods, beginning at 8:00 A. M. and ending at 4:00 P. M. with an hour for luncheon. The various phases of kiln drying and air seasoning of lumber were discussed by members of the laboratory staff best qualified to do so. In many cases the discussion of the various problems by the members of the conference somewhat interfered with the schedule. The important point is that the interest never lagged for a moment. That this interest was maintained during the conference is best attested to by the fact that at the close of the conference on Friday night all the schools were still represented but one, and that only two schools were missing for the Saturday morning session.

It is putting it modestly to say that the conference was a real success. The laboratory has most certainly made a long stride toward better co-operation with the Forest Schools, to the end that research in utilization problems may be advanced. It is to be hoped that this is only the beginning of such beneficial conferences to be held at the Forest Products Laboratory.

Robert Craig, Jr.,
Ann Arbor, Michigan.

Barriers to Reforestation

Incomplete Utilization an Important One

What are the barriers to a national program of reforestation? What is delaying the nation-wide production of second crops on private

cut-over lands? The Senate Select Committee of which Senator McNary was chairman and whose efforts bore fruit in the passage of the Clark-McNary Bill, believes that there are two principal barriers—the hazard of forest fires, and the burdensome taxation. These obstacles are usually the first and too often the only ones to come to the minds of foresters. Strangely enough, a number of leading timber land owners give only these two as the reasons for not engaging in tree production. Granting that forest fires and taxation are the real barriers, would these same owners adopt a program of forest growth on their cut-over lands if they could be insured at reasonable cost against loss by fire and if they could have their immature crops exempted from taxation? It is hardly likely. There is not enough in it or else the distant returns are not tempting enough.

There is a third and really more important barrier—*the crop is seldom worth enough.* Remove this big barrier, make the crop worth more, or make more of it worth something, and forestry becomes a real attractive investment. As for the other two barriers, lumbermen, once they have gone into timber farming as a business, may be depended upon to take very prominent parts in solving fire protection problems and in teaching local assessors the wisdom of taxing lightly while the crop is growing. It is a matter of wiser and more complete utilization, not only of saw logs but of every additional thing the soil has produced. The saw logs should be looked upon as only part of the crop. What of the saplings and poles, assuming clear cutting, and of the tops, limbs, broken chunks, and mill wastes? They are not now looked upon as part of the financial crop and at present they really have mighty little if any value. Right here is where we need vastly more information on what this stuff is good for and how it can be turned into money. This knowledge can be obtained only by painstaking and exhaustive research. To make some mechanical use of this low-grade material, such as working it into small size dimension stock and products, is often out of the question because of the large handling costs. There should be an additional way—one which would break this material down to a uniform lot of chips and then rebuild or transform it into a new material or objects, much the same as the steel maker takes all kinds of odds and ends of iron and steel junk, throws them into his open-hearth furnace and melts them down to a uniform mass which can then be recast and rolled into new and useful products. We can not melt and cast or forge wood, but we *can* put it through various chemical processes more complicated but analogous to the melt-

ing of metals. In the reduced and changed form it is not only amenable to reason but it can be coaxed into forming valuable products that might be liquid or solid and bearing no resemblance to the mother waste wood.

Utilization of low-grade or waste material would not remove the third barrier completely. We must know more about the properties and uses of what are now called inferior species, the cost of converting small trees into lumber, and whether or not it would be more profitable to leave and protect small stuff in the woods to serve as a nucleus or running start for a second crop. We must know more about the fabrication of wooden objects to get better utilization of the raw materials and greater service and permanence from the finished objects. The possibilities of developing real forestry in the woods through better utilization of forest products are confusing in their numbers and their ramifications, but they are paramount in a program of forestry and deserve equal if not foremost consideration to silviculture or reforestation.

Last November at the National Forest Products Utilization Conference held in Washington and called by the President, national attention was focused on the fact that the heavy drain on our forest resources is due in large part to poor utilization methods that we are not yet able to correct. Fortunately we have a governmental agency at Madison, Wisconsin—the Forest Products Laboratory—that is fully alive to the problem and is doing everything it can to obtain greater funds to expand its useful studies and make the results known. One of its recent undertakings has been the calling of a meeting or conference of those teachers in forest schools who specialize in forest products and utilization, in the belief that it is time to spread more widely its wealth of accumulated information. Its choice of this class of teachers was fortunate, for it lies on the shoulders of these men to train the foresters, lumbermen, and wood fabricators and users of the future. Moreover, this class should always have at its command the latest information, and the laboratory in turn should learn from them of their own investigations. The first general conference was held in early September and was devoted to lumber drying problems. In another note in this issue, Prof. Craig of Ann Arbor reports the proceedings at this meeting.

Emanuel Fritz,
University of California.

Michigan Conservation Council to Study Brush Disposal

At a recent meeting of the Executive Council of the Michigan Conservation Council the following resolution was adopted:

"Since slashings left after lumber operations constitute a great fire menace, the Michigan Conservation Council is to appoint a committee for the purpose of ascertaining the best methods, cost and effectiveness of brush disposal. This committee is to work in co-operation with the Lake States Forest Experiment Station and other State Forest organizations."

The Michigan Conservation Council is composed of representatives of all societies, clubs and organizations in the state which are interested in conservation matters.

European Foresters to Study in Lake States

Word has been received that Eilhard Wiedman, Professor of forestry at Tharandt, Saxony, will visit the Lake States Forest Experiment Station in the course of his tour of the experiment stations in the United States. He is studying in this country under the auspices of the Rockefeller International Board. Dr. Lauri Ilvessalo of Helsingflors, Finland, is also expected to visit the Lake States this winter.

Two Decades Under the Department of Agriculture

It is worthy of notice that the National Forests have now been administered by the Department of Agriculture for twenty fiscal years, a period beginning July 1, 1905, and ending June 30, 1925. The Transfer of the Forests to the Department actually occurred five months prior to July 1, 1905, but those first few months were given over mainly to organizing and coordinating the various lines of work. From year to year during the twenty-year period there has been a progressive and substantial increase in the amount of timber business transacted. Owing to lack of space it is not possible to give, by fiscal years, the detailed figures and thus show all of the significant and important developments in connection with the sale and free use of National Forest timber. Suffice it to say, that a comparison of the first fiscal year with the twentieth shows approximately a fifteenfold increase in receipts from timber sales, a thirteenfold increase in the number of sales, more than a sevenfold increase in the amount of timber cut under sales, and an 86 per cent increase in the average stumpage rate received. Equally interesting is a comparison of the timber bus-

iness during the first ten years with that of the last ten years of the twenty-year period, as a casual study of the following table will show. It will be noticed that every form of authorized timber use, except free use, more than doubled in volume and value during the second decade as compared with the first decade, and that timber trespass, an unauthorized use, actually decreased 52.5 per cent.

The appended tabulation summarizes the whole story by decades:

NATIONAL FOREST TIMBER SALES

	First decade F.Y. 1906-1915, incl.	Second decade F.Y. 1916-1925, incl.	Per cent of increase over first decade
Number of sales made............	54,781	127,410	132.6
Amount cut under sales—M feet....	3,952,277	8,277,367	109.4
Contract value of cut under sales....	$8,231,135	$19,745,983	139.9
Average price per M..............	$2.08	$2.39	14.9
Receipts:			
(a) Timber sales and settlement[1]	$8,789,525	$20,249,229	130.4
(b) Timber trepass.............	353,571	167,817	52.5 (decrease)
Free use:			
(a) Number of users............	313,750	379,768	21.0
(b) Amount cut M feet.....................	1,041,101	1,008,639	3.1 (decrease)
(c) Estimated value............	$1,589,840	$1,203,399	24.3 (decrease)

Changes in Address

The Editor finds that many subscribers of the Journal of Forestry are careless in notifying the Society of change in address. They forget to notify the Journal in time, with the result that postage must be paid on copies unclaimed and returned and then more postage for remailing them to the new address. With the present increased postage rates we often have to pay out in this way 20 cents per copy which is about one-third the printing cost.

We request therefore that all changes be reported promptly—not later than the middle of the month. When a subscriber neglects to inform the Journal of a change of address the editors may be justified in charging him the extra postage resulting from such neglect on his part.

[1]Not including receipts from turpentine sales. These amounted to $133,640 in the second decade and, according to the incomplete data available, to about half that figure in the first.

EXTRA NUMBERS OF FOREST TAXATION NUMBER ARE AVAILABLE

There have been a number of requests from Forest Schools and Economic Departments of Universities for copies of the September-October number on forest taxation. Some requests have been for as many as ten copies. To meet this demand an extra 100 copies have been printed. Those who wish to secure copies of this number should write at once for them as the surplus will be sold out within the next few weeks.

SOCIETY AFFAIRS

ANNUAL MEETING

The annual meeting of the Society will be held in Madison, Wisconsin, December 16 and 17. The first day will be devoted primarily to utilization subjects and will include an inspection of the Forest Products Laboratory during the afternoon. The second day will be devoted to a discussion of other forest subjects.

The Executive Council of the Society is to meet in Madison on December 14 and 15, immediately prior to the annual meeting.

R. Y. STUART.

PROGRAM

DECEMBER 16-17, 1925

Wednesday Morning, December 16

9:00 to 10:00.	Society affairs (Presentation of reports of President, Secretary, Treasurer, member in charge of admissions, Executive Council, and various committees, also discussion of above reports except reports of Executive Council and Committee on Revision of the Constitution and Establishment of By-Laws.)
10:00 to 10:15.	"The Interdependence of Utilization and Silviculture"—Earle H. Clapp.
10:15 to 10:45.	Discussion.
10:45 to 11:00.	"The Role of Utilization in the National Forest Program"—Carlile P. Winslow.
11:00 to 11:30.	Discussion.
11:30 to 11:45.	"Recent Developments in Forest Products Research in Relation to Forestry"—John D. Rue.
11:45 to 12:15.	Discussion.

Wednesday Afternoon, December 16

1:30 to 2:30.	Society affairs.
2:30 to 5:00.	Tour of inspection of the Forest Products Laboratory.

Wednesday Evening, December 16

7:00 P. M.	Banquet and entertainment by Wisconsin Section. Howard F. Weiss, Toastmaster.

Thursday Morning, December 17

8:30 to 10:00.	Society affairs (Discussion of reports of Executive Council, Committee on Revision of the Constitution, and Establishment of By-Laws).
10:00 to 10:15.	"Private Forestry"—David Mason.
10:15 to 10:45.	Discussion.
10:45 to 11:00.	"Research (other than utilization)"—Col. Graves.
11:00 to 11:30.	Discussion.
11:30 to 11:45.	"Technical Education"—Hugo Winkenwerder.
11:45 to 12:15.	Discussion.
12:15 to 12:30.	"Grazing"—Glenn Smith.

Thursday Afternoon, December 17

2:00 to 2:30.	Society affairs.
2:30 to 3:00.	Discussion of "Grazing."
3:00 to 3:15.	"Michigan Land Economic Survey"—H. J. Andrews.
3:15 to 3:45.	Discussion.
3:45 to 4:00.	"National, State, Municipal and Other Publicly Owned Forests in Relation to the National Forest Program"—J. S. Holmes.
4:00 to 4:30.	Discussion.
4:30 to 4:45.	"Recreation"—Arthur Ringland.
4:45 to 5:15.	Discussion.

Place of Meeting

Through the courtesy of the Forest Products Laboratory all sessions except the banquet will be held in the laboratory building on the University grounds.

Hotel Headquarters

The Hotel Loraine, a first-class new hotel, has been designated as hotel headquarters. In addition, the Belmont, an excellent new hotel, and the Park Hotel are available. The schedules of tariffs are as follows:

	Hotel Loraine	*Belmont Hotel*	*Park Hotel*
Room with bath, 1 person...........	$3.00	$2.50	$2.00–$3.00
Room with bath, two persons, each...	2.50	2.25	1.75– 2.50
Room without bath, 1 person.........	2.00	2.00	1.50
Two rooms, bath en suite, each......	...	2.25	...

The hotels are in the center of the city and are about one mile from the University Campus. The laboratory building may be reached

by direct car line. Reservations stipulating the type of accommodations desired should be mailed directly to the hotel selected. Early reservations are desirable.

Committees

Arrangements have been made for the reorganization of the Society Committee on Forest Education, which has been in existence since 1920. Under the new organization, forest education will be divided into six broad fields, each of which will be covered by a sub-committee. The main committee will be composed of its chairman and of the chairmen of the six sub-committees. While most of the work of the committee will undoubtedly be done through its sub-committees, this arrangement will provide for action on matters of general interest, and for considering, harmonizing, and promoting the recommendations of the various sub-committees.

The membership of the reorganized committee and sub-committees is as follows:

Committee on Forest Education

Hugo Winkenwerder, chairman, Dean, College of Forestry, University of Washington.

Sub-Committee on Graduate Work in Forestry

H. H. Chapman, chairman, Yale School of Forestry, New Haven, Conn.

John Bentley, Jr., Dept. of Forestry, Cornell University, Ithaca, N. Y.

Henry Schmitz, Division of Forestry, University of Minnesota, St. Anthony Park, St. Paul, Minn.

Sub-Committee on Non-Professional Courses and Extension Work in Forestry

K. W. Woodward, chairman, Department of Forestry, University of New Hampshire, Durham, N. H.

C. R. Anderson, Extension Specialist in Forestry, Pennsylvania State College, State College, Pa.

J. A. Cope, Extension Specialist in Forestry, Department of Forestry, Cornell University, Ithaca, N. Y.

P. D. Kelleter, Professor of Forest Extension, New York State College of Forestry, Syracuse, N. Y.

W. R. Mattoon, Forest Examiner, Forest Service, Washington, D. C.

Sub-Committee on Forest Research in Educational Institutions

R. T. Fisher, chairman, Director, Harvard Forest, Petersham, Mass.

E. H. Clapp, Assistant Forester, Forest Service, Washington, D. C.

Walter Mulford, Division of Forestry, University of California, Berkeley, Cal.

J. N. Spaeth, Department of Forestry, Cornell University, Ithaca, N. Y.

J. W. Toumey, Yale School of Forestry, New Haven, Conn.

Sub-Committee on Training of Specialists in Forest Products

N. C. Brown, chairman, New York State College of Forestry, Syracuse, N. Y.

D. R. Brewster, Welch Dry Kiln Co., Memphis, Tenn.

Emanuel Fritz, Division of Forestry, University of California, Berkeley, Cal.

H. S. Newins, Pennsylvania State College, State College, Pa.

C. V. Sweet, Forest Products Laboratory, Madison, Wis.

Sub-Committee on Vocational Training in Forestry

E. A. Ziegler, chairman, Pennsylvania State College of Forestry, Mont Alto, Pa.

J. F. Dubuar, Director, New York State Ranger School, Wanakena, N. Y.

T. C. Spaulding, Department of Forestry, University of Montana, Missoula, Mont.

Sub-Committee on Public Service in Forestry

H. P. Baker, chairman, Secretary, American Paper and Pulp Association, 18 E. 41st St., New York, N. Y.

B. L. Grondal, College of Forestry, University of Washington, Seattle, Wash.

P. S. Lovejoy, 1138 Fair Oaks, Ann Arbor, Mich.

F. G. Miller, College of Forestry, University of Idaho, Moscow, Ida.

L. J. Young, Department of Forestry, University of Michigan, Ann Arbor, Mich.

Other committees which have been completed or newly appointed since the list published in the Journal of Forestry for July and August, 1925, are as follows:

Committee on Utilization of Forest Products

C. P. Winslow, chairman, Director, Forest Products Laboratory, Madison, Wis.

O. M. Butler, Secretary, American Forestry Association, Washington, D. C.

John Foley, Pennsylvania Railroad, Philadelphia, Pa.

R. Y. Stuart, Secretary, Department of Forests and Waters, Harrisburg, Pa.

Hugo Winkenwerder, Dean, College of Forestry, University of Washington, Seattle, Wash.

Committee on the Revision of the Constitution

E. H. Frothingham, chairman, Appalachian Forest Experiment Station, Asheville, N. C.

Walter Mulford, Division of Forestry, University of California, Berkeley, Cal.

Committee on Formulation of a National Forest Policy

R. C. Bryant, chairman, Yale School of Forestry, New Haven, Conn.

R. T. Fisher, Harvard Forest, Petersham, Mass.

Committee on Forest Terminology

S. N. Spring, chairman, Department of Forestry, Cornell University, Ithaca, N. Y.

R. C. Bryant, utilization and protection, Yale School of Forestry, New Haven, Conn.

E. E. Carter, silviculture, silvics, and forest description, Forest Service, Washington, D. C.

A. B. Recknagel, organization, mensuration, and management, Department of Forestry, Cornell University, Ithaca, N. Y.

E. A. Ziegler, valuation, administration, and general terms, Pennsylvania State School of Forestry, Mont Alto, Pa.

The Committee on Terminology has been revived as a standing committee, since it is clear that no finality can be claimed for the reports submitted by the original committee, and that changes will be necessary from time to time to keep the terminology up-to-date and adequate for the needs of the profession. The revived committee is being composed of the chairmen of the former sub-committees, each of which covered a specific field. The only changes in this respect are that Professor Spring replaces Dr. Fernow as chairman of the committee and Mr. Carter takes Professor Spring's place as a member of the former sub-committee on silviculture, silvics, and forest description.

INDEX

art. = article; rev. = review; c. l. = current literature; n. = note; s. a. = society affairs; ref. = reference.

CONTENTS